US006779019B1

(12) **United States Patent**
Mousseau et al.

(10) **Patent No.: US 6,779,019 B1**
(45) **Date of Patent: Aug. 17, 2004**

(54) **SYSTEM AND METHOD FOR PUSHING INFORMATION FROM A HOST SYSTEM TO A MOBILE DATA COMMUNICATION DEVICE**

(75) Inventors: **Gary P. Mousseau**, Waterloo (CA); **Tabitha Ferguson**, Waterloo (CA); **Barry Linkert**, Petersburg (CA); **Raymond Vander Veen**, Kitchener (CA); **David Castell**, Waterloo (CA); **Mihal Lazaridis**, Waterloo (CA)

(73) Assignee: **Research In Motion Limited**, Waterloo (CA)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/545,963**

(22) Filed: **Apr. 10, 2000**

Related U.S. Application Data

(63) Continuation-in-part of application No. 09/087,623, filed on May 29, 1998, now Pat. No. 6,219,694.

(51) **Int. Cl.**[7] **G06F 15/16**; G06F 17/30

(52) **U.S. Cl.** **709/206**; 709/207; 709/245; 707/201; 707/203; 340/7.21; 340/7.29; 340/7.51; 455/556.1

(58) **Field of Search** 709/206, 207, 709/249, 245, 253; 707/201, 203; 340/7.21, 7.29, 7.51; 455/556.1, 556.2

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,106,060	A	8/1978	Chapman, Jr.
4,417,349	A	11/1983	Hills et al.
4,438,433	A	3/1984	Smoot et al.
4,558,454	A	12/1985	Hills et al.
4,644,351	A	2/1987	Zabarsky et al.
4,695,880	A	9/1987	Johnson et al.
4,697,281	A	9/1987	O'Sullivan
4,713,780	A	12/1987	Schultz et al.
4,768,087	A	8/1988	Taub et al.
4,837,798	A	6/1989	Cohen et al.

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

EP	0617373	9/1994
EP	0736989	10/1996
EP	0772327	5/1997
EP	0777394	6/1997
EP	0788287	8/1997

(List continued on next page.)

OTHER PUBLICATIONS

Sun Microsystems, JavaMail API Design Specification, Version 1.0, Dec. 9, 1997, Sun Microsystems, Inc., chapters 1–10 appendices A–E.*

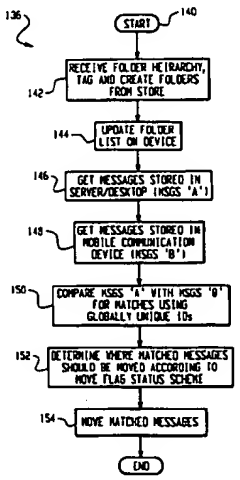
(List continued on next page.)

Primary Examiner—Glenton B. Burgess
Assistant Examiner—Bradley Edelman
(74) *Attorney, Agent, or Firm*—Jones Day; Krishna K. Pathiyal, Esq.; Charles B. Meyer, Esq.

(57) **ABSTRACT**

A system and method of pushing user-selected data items from a host system to a user's mobile data communication device upon detecting the occurrence of one or more user-defined event triggers is provided. The user may then move (or file) the data items to a particular folder within a folder hierarchy stored in the mobile data communication device, or may execute some other system operation on the data item. Software operating at the mobile device and the host system then synchronizes the folder hierarchy of the mobile device with a folder hierarchy of the host system, and any actions executed on the data items at the mobile device are then automatically replicated on the same data items stored at the host system, thus eliminating the need for the user to manually replicate actions at the host system that have been executed at the mobile data communication device.

16 Claims, 15 Drawing Sheets



U.S. PATENT DOCUMENTS

4,837,800	A		6/1989	Freeburg et al.
4,845,658	A		7/1989	Gifford
4,856,047	A		8/1989	Saunders
4,928,096	A		5/1990	Leonardo et al.
4,951,044	A		8/1990	Nelson et al.
4,972,457	A		11/1990	O'Sullivan
4,980,907	A		12/1990	Raith et al.
5,008,926	A		4/1991	Misholi
5,043,721	A		8/1991	May
5,068,916	A		11/1991	Harrison et al.
5,086,502	A		2/1992	Malcolm
5,125,021	A		6/1992	Lebowitz
5,127,041	A		6/1992	O'Sullivan
5,128,981	A		7/1992	Tsukamoto et al.
5,136,291	A		8/1992	Teague
5,157,660	A		10/1992	Kuwahara et al.
5,159,592	A		10/1992	Perkins
5,177,680	A		1/1993	Tsukino et al.
5,181,200	A		1/1993	Harrison
5,265,033	A		11/1993	Vajk et al.
5,283,887	A		2/1994	Zachery
5,293,250	A		3/1994	Okumura et al.
5,299,255	A		3/1994	Iwaki et al.
5,307,059	A		4/1994	Connary et al.
5,313,582	A		5/1994	Hendel et al.
5,315,635	A		5/1994	Kane et al.
5,333,152	A		7/1994	Wilber
5,333,266	A		7/1994	Boaz et al.
5,392,390	A		2/1995	Crozier
5,406,557	A		4/1995	Baudoin
5,410,543	A		4/1995	Seitz et al.
5,416,473	A		5/1995	Dulaney, III et al.
5,436,960	A		7/1995	Campana, Jr. et al.
5,438,611	A		8/1995	Campana, Jr. et al.
5,452,356	A		9/1995	Albert
5,479,472	A		12/1995	Campana, Jr. et al.
5,493,692	A		2/1996	Theimer et al.
5,495,484	A		2/1996	Self et al.
5,559,800	A		9/1996	Mousseau et al.
5,572,528	A		11/1996	Shuen
5,579,472	A		11/1996	Keyworth, II et al.
5,588,009	A		12/1996	Will
5,598,536	A		1/1997	Slaughter, III et al.
5,603,054	A		2/1997	Theimer et al.
5,604,491	A		2/1997	Coonley et al.
5,604,788	A		2/1997	Tett
5,625,670	A		4/1997	Campana, Jr. et al.
5,627,829	A		5/1997	Gleeson et al.
5,630,060	A		5/1997	Tang et al.
5,633,810	A		5/1997	Mandal et al.
5,638,450	A		6/1997	Robson
5,641,946	A		6/1997	Shim
5,666,530	A		9/1997	Clark et al.
5,666,553	A		9/1997	Crozier
5,673,322	A		9/1997	Pepe et al.
5,701,423	A		12/1997	Crozier
5,705,995	A		1/1998	Laflin et al.
5,727,202	A		3/1998	Kucala
5,729,735	A		3/1998	Meyering
5,737,531	A		4/1998	Ehley
5,742,905	A		4/1998	Pepe et al.
5,751,971	A		5/1998	Dobbins et al.
5,754,954	A		5/1998	Cannon et al.
5,757,901	A		5/1998	Hiroshige
5,758,150	A		5/1998	Bell et al.
5,758,354	A	*	5/1998	Huang et al. 707/201
5,761,416	A		6/1998	Mandal et al.
5,764,639	A		6/1998	Staples et al.
5,765,170	A		6/1998	Morikawa
5,781,614	A		7/1998	Brunson
5,781,901	A		7/1998	Kuzma
5,790,790	A		8/1998	Smith et al.
5,790,974	A		8/1998	Tognazzini
5,796,806	A		8/1998	Birckbichler
5,812,773	A	*	9/1998	Norin 709/204
5,812,819	A		9/1998	Rodwin et al.
5,813,016	A		9/1998	Sumimoto
5,815,081	A		9/1998	Motohashi
5,819,172	A		10/1998	Campana, Jr. et al.
5,819,284	A		10/1998	Farber et al.
5,822,434	A		10/1998	Caronni et al.
5,826,062	A		10/1998	Fake, Jr. et al.
5,838,926	A		11/1998	Yamagishi
5,844,969	A		12/1998	Goldman et al.
5,850,219	A		12/1998	Kumomura
5,867,660	A		2/1999	Schmidt et al.
5,878,434	A		3/1999	Draper et al.
5,903,723	A		5/1999	Beck et al.
5,905,777	A		5/1999	Foladare et al.
5,917,629	A		6/1999	Hortensius et al.
5,928,329	A		7/1999	Clark et al.
5,937,161	A		8/1999	Mulligan et al.
5,953,322	A		9/1999	Kimball
5,961,590	A		10/1999	Mendez et al.
5,966,714	A	*	10/1999	Huang et al. 707/201
5,968,131	A		10/1999	Mendez et al.
5,969,636	A		10/1999	Parvulescu et al.
5,973,612	A		10/1999	Deo et al.
5,974,180	A		10/1999	Schwendeman
5,974,238	A	*	10/1999	Chase, Jr. 709/248
5,978,689	A		11/1999	Tuoriniemi et al.
5,978,837	A		11/1999	Foladare et al.
5,983,073	A		11/1999	Ditzik
5,995,597	A		11/1999	Woltz et al.
6,000,000	A		12/1999	Hawkins et al.
6,006,274	A		12/1999	Hawkins et al.
6,014,429	A		1/2000	LaPorta et al.
6,023,700	A		2/2000	Owens et al.
6,023,708	A		2/2000	Mendez et al.
6,034,621	A		3/2000	Kaufman
6,052,563	A		4/2000	Macko
6,052,735	A		4/2000	Ulrich et al.
6,058,431	A		5/2000	Srisuresh et al.
6,073,137	A	*	6/2000	Brown et al. 707/104.1
6,073,165	A		6/2000	Narasimhan et al.
6,078,826	A		6/2000	Croft et al.
6,085,192	A		7/2000	Mendez et al.
6,085,232	A		7/2000	Kikinis
6,091,951	A		7/2000	Sturniolo et al.
6,092,114	A		7/2000	Shaffer et al.
6,092,191	A		7/2000	Shimbo et al.
6,101,531	A		8/2000	Eggleston et al.
6,115,394	A		9/2000	Balachandran et al.
6,115,736	A		9/2000	Devarakonda et al.
6,125,281	A		9/2000	Wells et al.
6,125,369	A	*	9/2000	Wu et al. 707/201
6,130,892	A		10/2000	Short et al.
6,131,096	A		10/2000	Ng et al.
6,131,116	A		10/2000	Riggins et al.
6,141,690	A		10/2000	Weiman
6,151,606	A		11/2000	Mendez
6,157,318	A		12/2000	Minata
6,157,950	A		12/2000	Krishman
6,163,274	A		12/2000	Lindgren
6,167,379	A		12/2000	Dean et al.
6,178,331	B1		1/2001	Holmes et al.
6,185,603	B1		2/2001	Henderson et al.
6,202,085	B1	*	3/2001	Benson et al. 709/205
6,233,341	B1		5/2001	Riggins
6,240,088	B1		5/2001	Gayton et al.
6,249,820	B1		6/2001	Dobbins et al.

6,256,666	B1	7/2001	Singhal	
6,272,545	B1	8/2001	Flanagin et al.	
6,275,848	B1	8/2001	Arnold	
6,275,850	B1	8/2001	Beyda et al.	
6,311,282	B1	10/2001	Nelson et al.	
6,324,544	B1 *	11/2001	Alam et al.	707/201
6,324,587	B1 *	11/2001	Trenbeath et al.	709/310
6,356,937	B1 *	3/2002	Montville et al.	709/206
6,360,272	B1	3/2002	Lincke et al.	
6,470,358	B1 *	10/2002	Beyda et al.	707/201
6,487,560	B1 *	11/2002	LaRue et al.	707/203
6,505,214	B1 *	1/2003	Sherman et al.	707/201
2002/0059380	A1 *	5/2002	Biliris et al.	709/206
2002/0099719	A1 *	7/2002	Schwitters et al.	707/104.1

FOREIGN PATENT DOCUMENTS

EP	09214556	8/1997
EP	0793387	9/1997
EP	0825788	2/1998
EP	0838774	4/1998
EP	0838934	4/1998
EP	0772327	2/1999
EP	0930766	7/1999
EP	0986225	3/2000
US	0001552	5/2001
US	0029531	10/2001
US	0040693	11/2001
US	0042093	11/2001
US	0054072	12/2001
WO	9619064	6/1996
WO	9726709	7/1997
WO	9727717	7/1997
WO	9732251	9/1997
WO	9733421	9/1997
WO	9741654	11/1997
WO	9744942	11/1997
WO	9800787	1/1998
WO	9821911	5/1998
WO	9823108	5/1998
WO	9826344	6/1998
WO	9848560	10/1998
WO	9905620	2/1999
WO	9905813	2/1999
WO	9906900	2/1999
WO	9917505	4/1999
WO	9919988	4/1999
WO	9936870	7/1999
WO	9945484	9/1999
WO	9948312	9/1999
WO	9950974	10/1999
WO	9963709	12/1999
WO	0011567	3/2000
WO	0011832	3/2000
WO	0020994	4/2000
WO	0113572	2/2001
WO	0171539	9/2001

OTHER PUBLICATIONS

Compaq, Aero 2100 Series Color Palm-size PC Reference Guide, Second Edition, Aug. 1999, Compaq Corporation.*

Business Wire, Puma Technology Introduces New Version of Intellisync Software for the Palm Computing Platform and Windows CE, Oct. 4, 1999, Business Wire, pp. 1ff.*

Business Wire, Puma Technology Introduces Intellisync Version 3.1 Software for Palm Computing Platform Products, Nov. 24, 1998, Business Wire, pp. 1ff.*

Business Wire, Puma Technology to Ship Next Generation Intellisync Software for Palm Computing Platform Products, Jul. 28, 1998, Business Wire, pp. 1ff.*

Puma Technology, Inc., Intellisync Anywhere for Lotus Domino, 1999, pp. 1–2.*

3Com, Handbook for the Palm VII Organizer, 1998, 3Com Corporation, pp. i–vii, 1, 163–194.*

3Com, PalmPilot Professional Handbook, 1997, 3Com Corporation, pp. i–iv, 1–71.*

SAM Reference Manual, System for Automated Messages (Sep. 1989).

IBM Portable Terminal User's Guide, Third Edition (Jun. 1985).

Binder, Richard et al, The Alohanet Menehune, University of Hawaii, Version II (Sep. 1974).

Computer Structures—Principles and Examples, McGraw Hill (1982).

Krebs, Jay, Portable Computer and Host Talk Over Radio–Frequency Link, Electronic, pp. 142–145 (Aug. 25, 1983_.

"BlackBerry Technical White Paper," Research In Motion Ltd., Version 1.0, 1998–1999.

Newsletter, "Battery Friendly Bulletin," vol. 1, Issue 3, pp. 1–7 and unnumbered page, 1999.

Article, Comerford, "Handhelds Duke It Out for the Internet," Wireless Internet, pp. 35–38 and 41, Aug. 2000.

Press Detail, "Extended Systems and Motorola Bring Short–Range Wireless to the Paging E–volution," Jan. 13, 2000 (3 pgs.).

Press Detail, "3Com Corporation Licenses Bluetooth Technology from Extended Systems," Feb. 22, 2000 (2 pgs.).

Web site Article, Hawaleshka, "The Web in Your Pocket," Maclean's, May 15, 2000 (3 pgs.).

Claxton, "Messaging API's for Voice Networks," Telecommunications, pp. 116–120, 1998.

Gifford, David K., et al., "The Application of Digital Broadcast Communication to Large Scale Information Systems." IEEE Journal on Selected Areas in Communications, vol. SAC–3, No. 3, pp. 457–467 (May 1985).

Gifford, David K., et al., "An Architecture for Large Scale Information Systems," ACM, pp. 161–170 (1985).

Egevang, K. et al., "The IP Network Address Translator," Network Working Group, pp. 1–10, May 1994.

Manual, "Server and BBS Software for the Packet Radio" by Jean Paul Roubelat, pp. 1–173.

Book, "Internetwork Mobility The CDPD Approach," by Mark S. Taylor, William Waung, and Mohsen Banan, Jun. 11, 1996.

News Release, "Motorola Rings in 1995 with the Launch of the Marco® Wireless Communicator," Jan. 4, 1995 (4 pgs.).

Timeline, "FLEX™ Technology Timeline," (3 pgs.).

General Magic, Inc., Corporate Backgrounder, 2001 (2 pgs.).

Pegasus Email Settings, ABSnet Internet Services, Inc. (4 pgs.).

Motorola, Inc., emailVClient, 2001 (4 pages).

News Release, "Motorola Announces Pagewriter 250, The World's Smallest Pager with Full Keyboard", Feb. 27, 1997 (2 pgs.).

Dewey, Barney, "Communications Strategies for Newton 2.0," Newton Technology Journal, p. 10, Jun. 1996.

Press Release, "Motorola Announces New Solutions to Provide Consumers with Wireless Access to Personal and Enterprise E–mail Accounts," Mar. 21, 2001 (4 pgs.).

"Motorola's 'Marco' Wireless Communicator," http://www.msu.edu/–luckie/gallery/marco.htm, Jun. 14, 2001 (3 pgs.).

News Release, "CE Software Announces MobileVision," Editorial Contacts, CE Software, Inc., 1995 (3 pgs.).

News Release, "CE Software Ships MobileVision," Jun. 20, 1995 (3 pgs.).
Newton Reference, Communications, 1996–1997(4 pgs.).
PC Pro Issue 31: Realworld Computing, PDA Column, Jul. 30, 1997 (7 pgs.).
Enterprise Solutions for Email Overload, Founder Publications, http://www.amikanow.com/corporte/publications.htm, Aug. 6, 2001 (9 pgs.).
"Motorola's 'Marco' Wireless Communicator," http://www.msu.edu/~luckie/gallery/marco.htm, Aug. 6, 2001 (2 pgs.).
Press Release, "Apple Agrees to License Newton Technology to Schlumberger, Digital Ocean," Nov. 3, 1995 (3 pgs.).
Frezza, Bill, "PDA, PDA, Wherefore Art Thou, PDA?", Freewire, Aug. 6, 2001 (6 pgs.).
Black, Lauren, et al., "Personal Digital Assistants," Macworld Reviews, Aug. 6, 2001 (5 pgs.).
Reference, "MobileVision Direct Wireless Connection to Your LAN–Based Electronic Mailbox," CE Software, Inc., pp. 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 1995.
User Manual, "MobileVision Direct Wireless Connection to Your LAN–Based Electronic Mailbox," CE Software, Inc. 1995.
Johnson, David B., "Ubiquitous Mobile Host Internetworking," Fourth Workshop on Workstation Operating Systems, pp. 85–90, Oct. 14–15, 1993.
Johnson, David B., "Mobile Host Internetworking Using IP Loose Source Routing," School of Computer Science, Carnegie Mellon University, pp. 1–14 Feb. 1993.
Schoettle, Bob, "IP–Address Management on LANs," Byte, pp. 199–200, Feb. 1996.
Cheshire, Stuart, et al., "Internet Mobility 4×4," Computer Science Department, Stanford University, pp. 1–12, Aug. 1996.
Yeom, Hoen Y., et al., "IP Mutliplexing by Transparent Port–Address Translator," Proceedings of the Tenth USENIX System Administration Conference, pp. 113–122, Sep. 29–Oct. 4, 1996.
Johnson, David B., "Scalable and Robust Internetwork Routing for Mobile Hosts," IEEE Computer Society, pp. 2–11, 1994.
Perkins, Charles, "IMHP: A Mobile Host Protocol for the Internet," Computer Networks and ISDN System, vol. 27, pp. 479–491, 1994.
Proceedings of the IEEE 7th International Workshop on Network and Operating System Support for Digital Audio and Video, Innsbrook Estates Conference Center, May 19–21, 1997, pp. 135–146.
Lucent Technologies, Bell Labs Technical Journal, vol. 2, No. 3, pp. 152–163, Summer 1997.
Lavana, Hemang, et al., Internet–Based Workflows: A Paradigm for Dynamically Reconfigurable Desktop Environments, Group 97, pp. 204–213, 1997.
Perkins, Charles E., et al., "Mobility Support in IPv6," Mobicom 96, pp., 27–37, 1996.
Goldszmidt, German, et al., "ShockAbsorber: A TCP Connection Router," IEEE, vol. 3, pp. 1919–1923, 1997.
Padwick, et al., Special Edition Using Microsoft Outlook 97, 1997, Que Corporation, pp. 250–251, 353–367.
Feibus, "A Desktop In Your Palm", Informationweek, Aug. 25, 1997, pp. 65ff.
Behr, "Handheld Solutions", Informationweek, Oct. 27, 1997, pp. 106–113.
Copy of DTS Wireless Website located at D.R.L. http://www.dtswireless.com.
"3Com PalmPilot Gets Wireless Link for E–Mail", Spooner, John G., PC Week, Dec. 8, 1997.
"Have Your Pager Call My Pager", Sullivan, Kristina B., PC Week, Dec. 8, 1997.

* cited by examiner

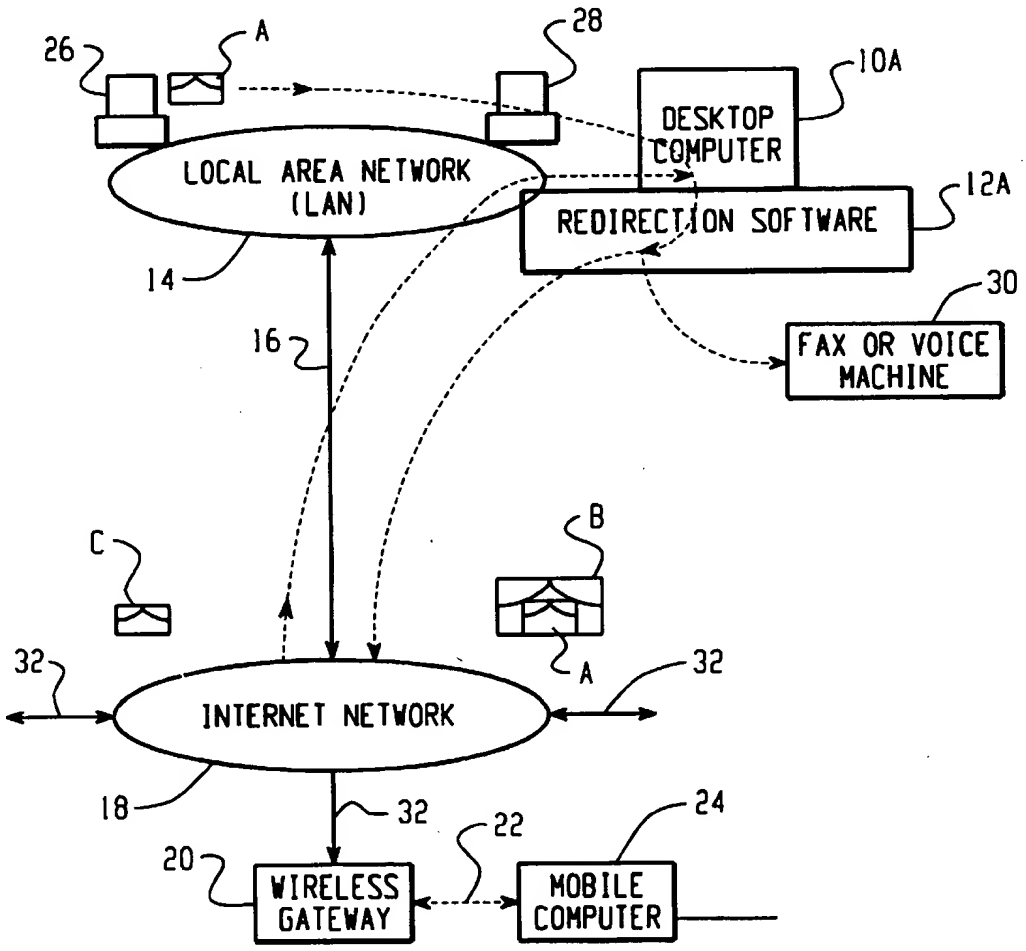

26
A
28
10A
DESKTOP COMPUTER
LOCAL AREA NETWORK (LAN)
12A
REDIRECTION SOFTWARE
14
30
16
FAX OR VOICE MACHINE
C
B
A
32
32
INTERNET NETWORK
18
32
22
24
20
WIRELESS GATEWAY
MOBILE COMPUTER

Fig. 1

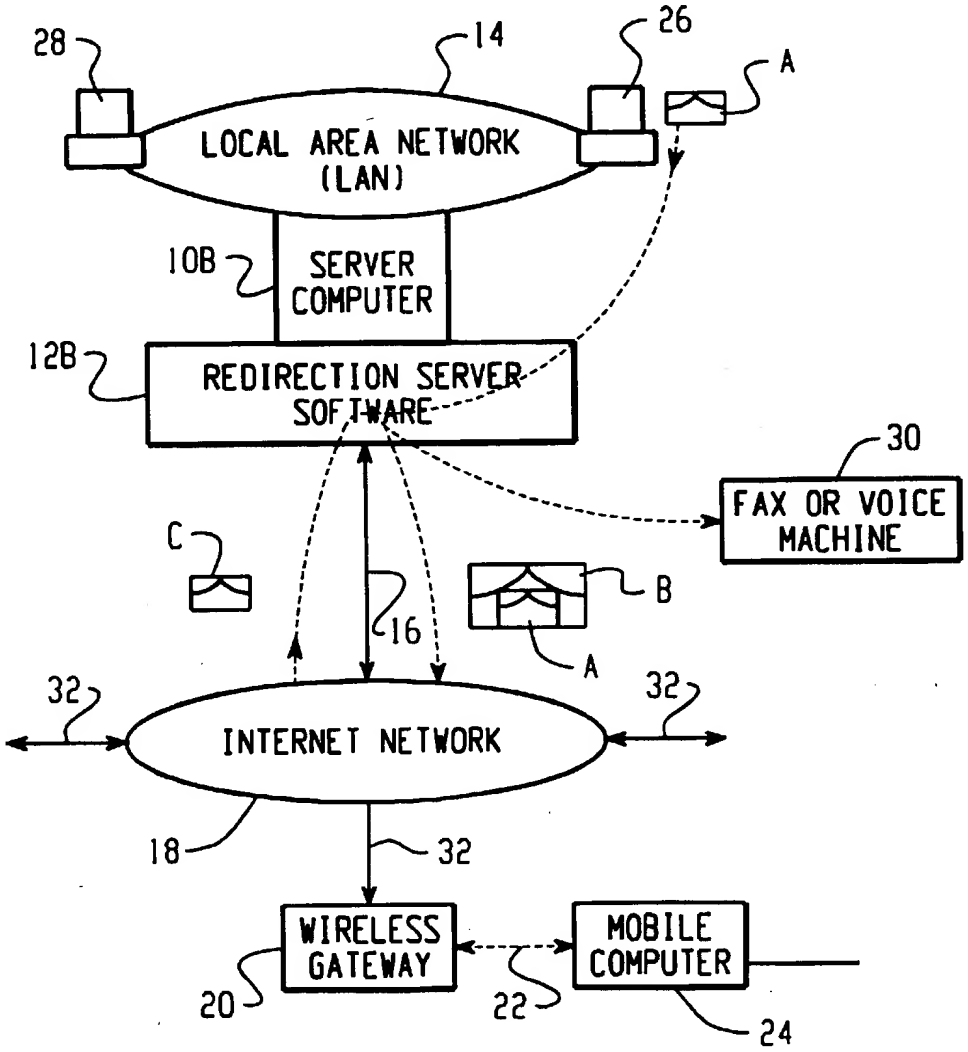

28
14
26
A
LOCAL AREA NETWORK (LAN)
10B
SERVER COMPUTER
12B
REDIRECTION SERVER SOFTWARE
30
FAX OR VOICE MACHINE
C
B
16
A
32
32
INTERNET NETWORK
18
32
WIRELESS GATEWAY
MOBILE COMPUTER
20
22
24

Fig. 2

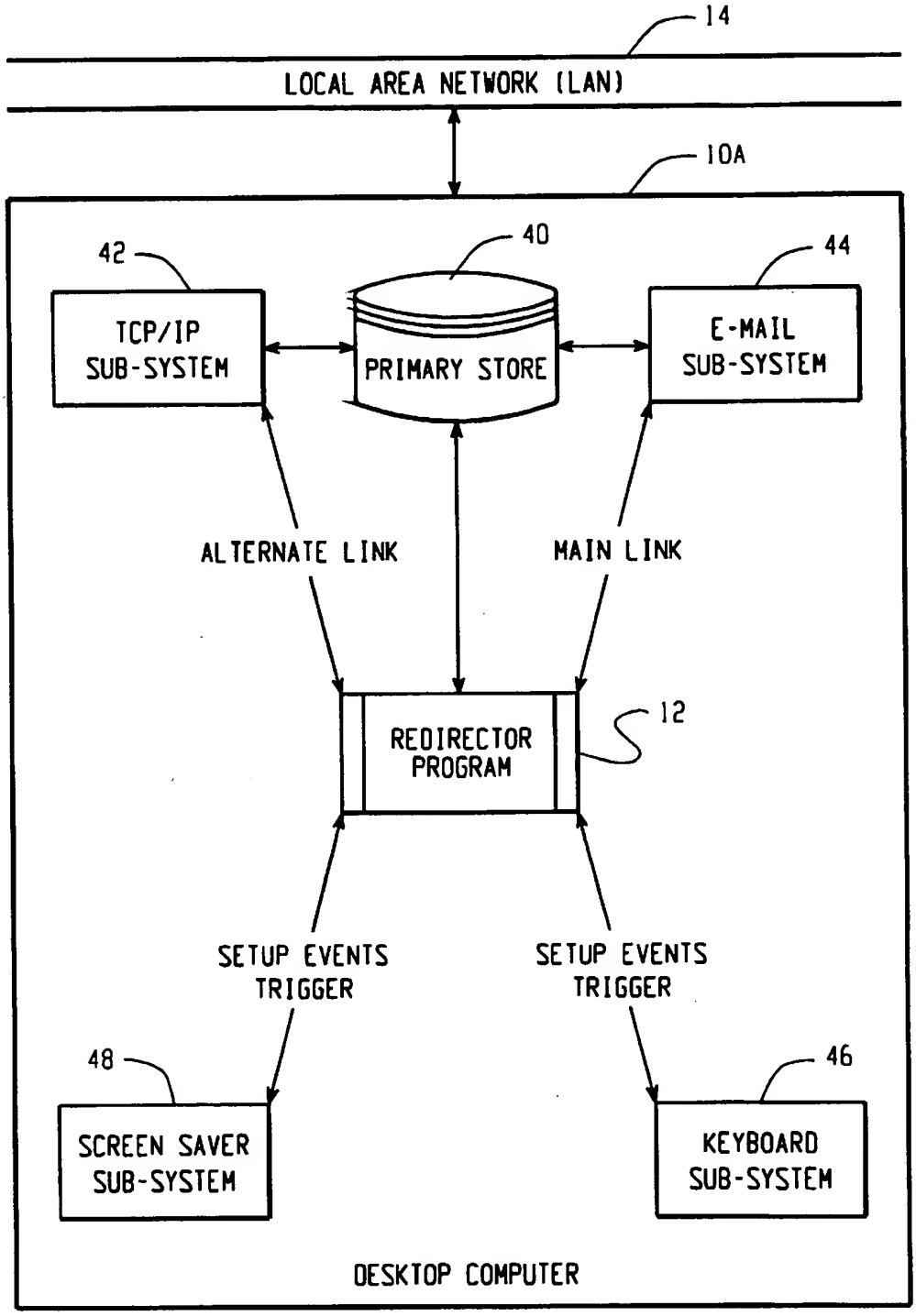

14
LOCAL AREA NETWORK (LAN)
10A
42
40
44
TCP/IP SUB-SYSTEM
PRIMARY STORE
E-MAIL SUB-SYSTEM
ALTERNATE LINK
MAIN LINK
REDIRECTOR PROGRAM
12
SETUP EVENTS TRIGGER
SETUP EVENTS TRIGGER
48
46
SCREEN SAVER SUB-SYSTEM
KEYBOARD SUB-SYSTEM
DESKTOP COMPUTER

Fig. 3

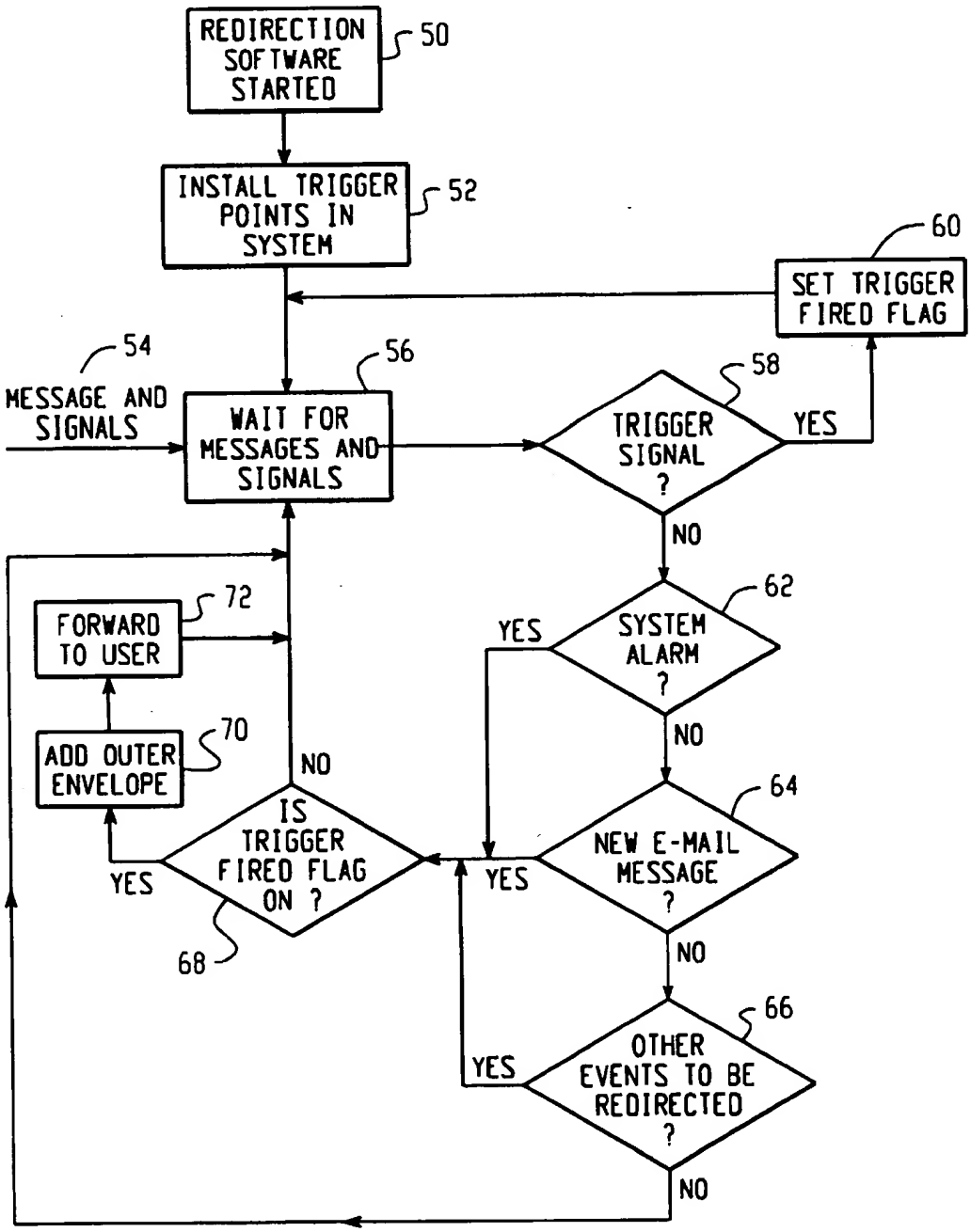

REDIRECTION SOFTWARE STARTED
50
INSTALL TRIGGER POINTS IN SYSTEM
52
60
SET TRIGGER FIRED FLAG
54
MESSAGE AND SIGNALS
56
WAIT FOR MESSAGES AND SIGNALS
58
TRIGGER SIGNAL ?
YES
NO
62
SYSTEM ALARM ?
YES
NO
64
NEW E-MAIL MESSAGE ?
YES
NO
66
OTHER EVENTS TO BE REDIRECTED ?
YES
NO
72
FORWARD TO USER
70
ADD OUTER ENVELOPE
IS TRIGGER FIRED FLAG ON ?
YES
NO
68

Fig. 4

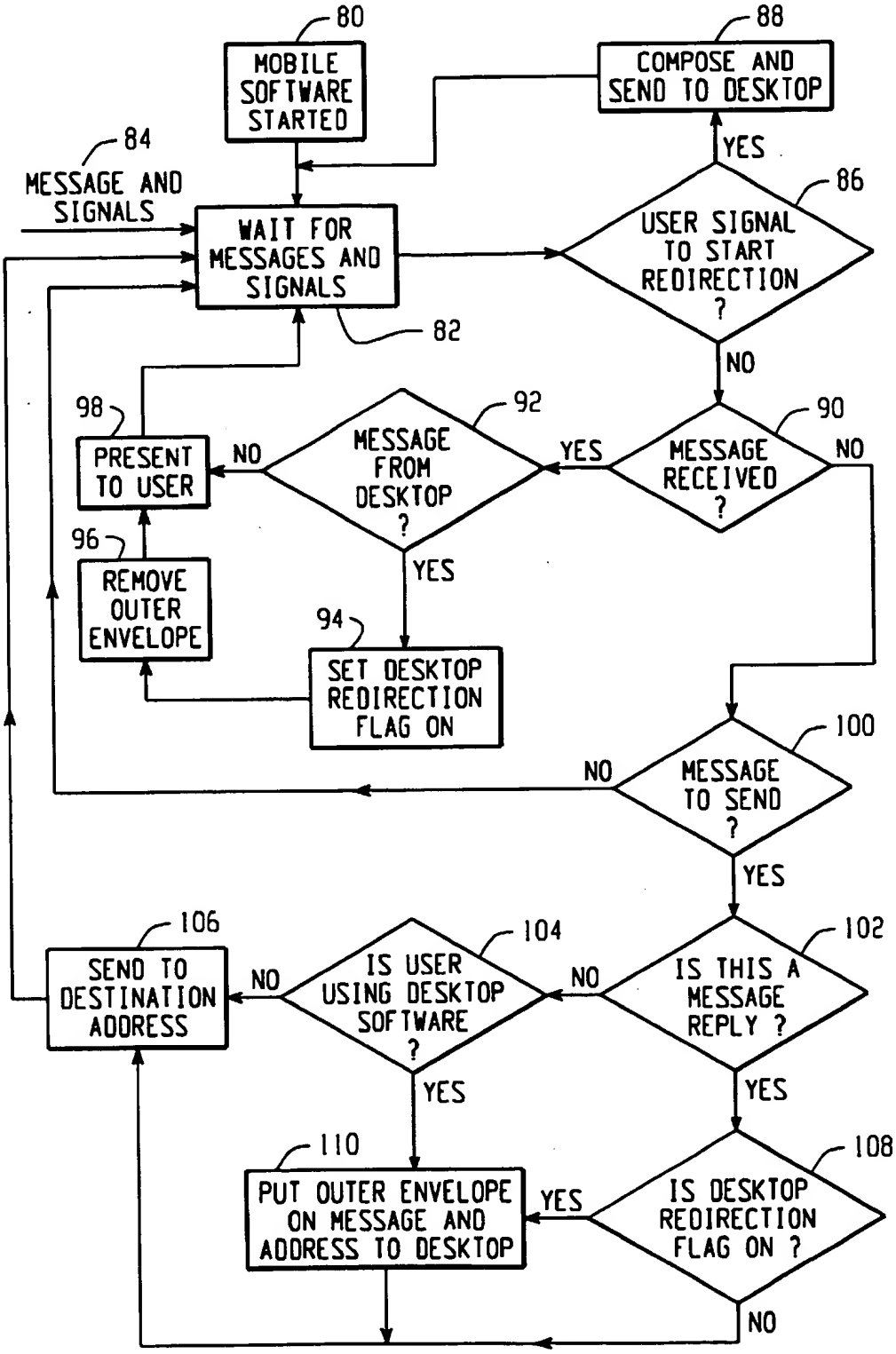
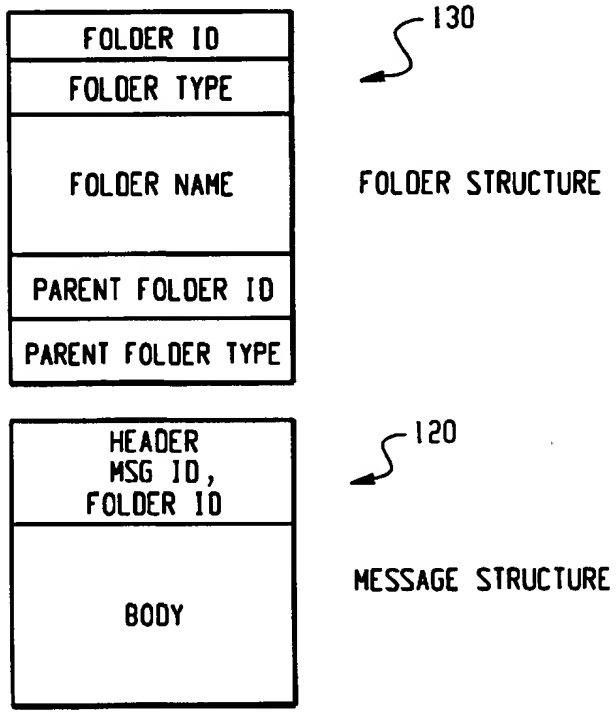

80
MOBILE SOFTWARE STARTED
88
COMPOSE AND SEND TO DESKTOP
84
MESSAGE AND SIGNALS
WAIT FOR MESSAGES AND SIGNALS
82
YES
86
USER SIGNAL TO START REDIRECTION ?
NO
98
PRESENT TO USER
NO
92
MESSAGE FROM DESKTOP ?
YES
90
MESSAGE RECEIVED ?
NO
96
REMOVE OUTER ENVELOPE
YES
94
SET DESKTOP REDIRECTION FLAG ON
100
NO
MESSAGE TO SEND ?
YES
106
SEND TO DESTINATION ADDRESS
NO
104
IS USER USING DESKTOP SOFTWARE ?
NO
102
IS THIS A MESSAGE REPLY ?
YES
YES
110
PUT OUTER ENVELOPE ON MESSAGE AND ADDRESS TO DESKTOP
YES
108
IS DESKTOP REDIRECTION FLAG ON ?
NO

Fig. 5

Fig. 6


FOLDER ID
FOLDER TYPE
FOLDER NAME
PARENT FOLDER ID
PARENT FOLDER TYPE
130
FOLDER STRUCTURE
HEADER
MSG ID,
FOLDER ID
BODY
120
MESSAGE STRUCTURE

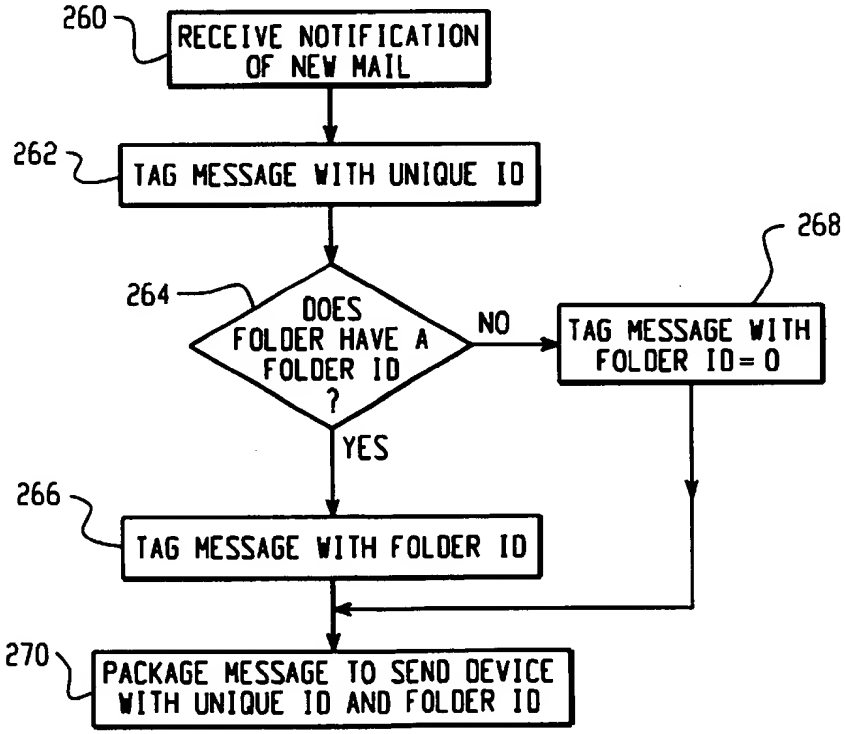

260
RECEIVE NOTIFICATION OF NEW MAIL
262
TAG MESSAGE WITH UNIQUE ID
264
DOES FOLDER HAVE A FOLDER ID ?
NO
268
TAG MESSAGE WITH FOLDER ID=0
YES
266
TAG MESSAGE WITH FOLDER ID
270
PACKAGE MESSAGE TO SEND DEVICE WITH UNIQUE ID AND FOLDER ID

Fig. 11

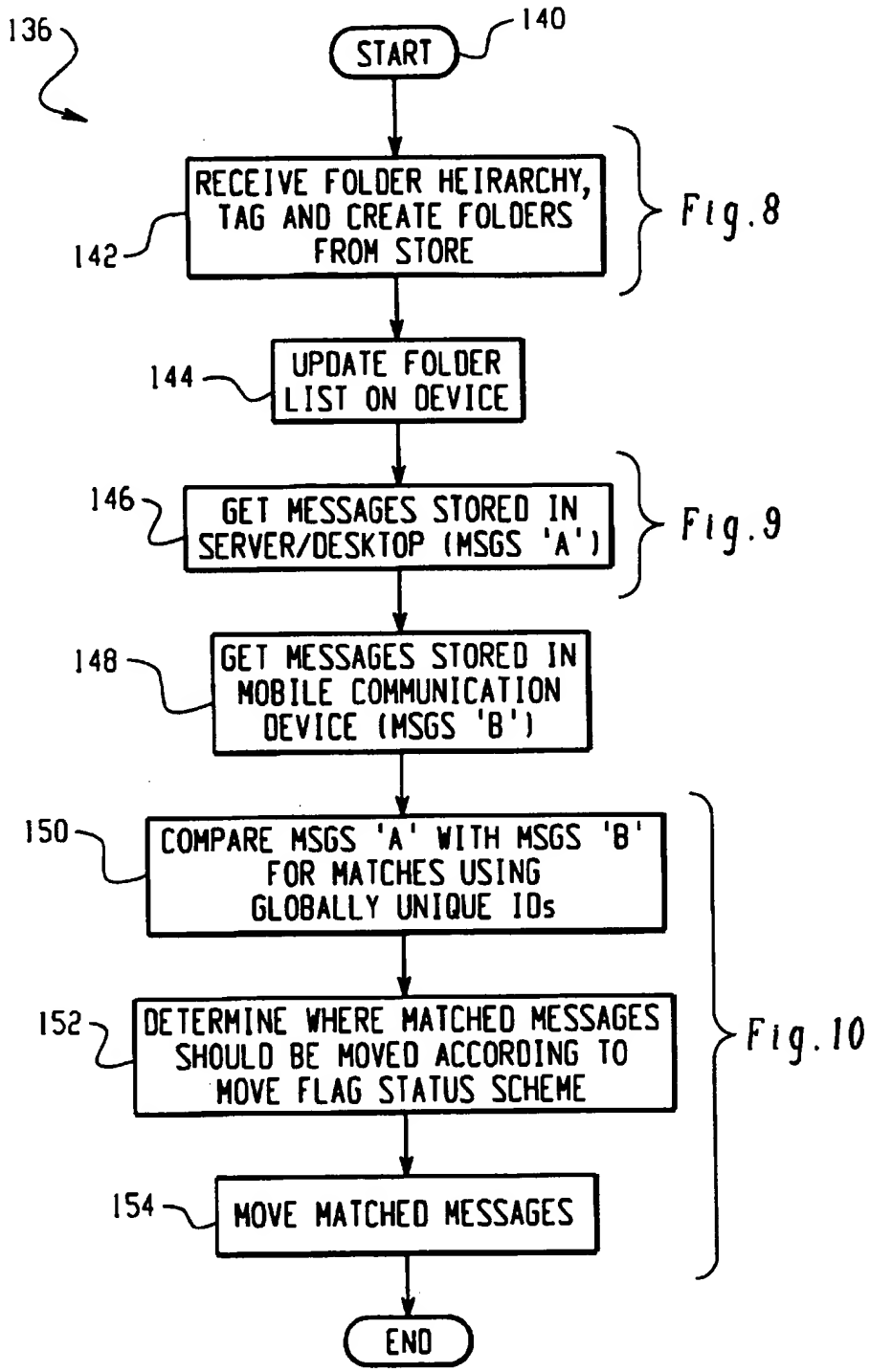

136
START
140
RECEIVE FOLDER HEIRARCHY, TAG AND CREATE FOLDERS FROM STORE
142
Fig.8
UPDATE FOLDER LIST ON DEVICE
144
GET MESSAGES STORED IN SERVER/DESKTOP (MSGS 'A')
146
Fig.9
GET MESSAGES STORED IN MOBILE COMMUNICATION DEVICE (MSGS 'B')
148
COMPARE MSGS 'A' WITH MSGS 'B' FOR MATCHES USING GLOBALLY UNIQUE IDs
150
DETERMINE WHERE MATCHED MESSAGES SHOULD BE MOVED ACCORDING TO MOVE FLAG STATUS SCHEME
152
MOVE MATCHED MESSAGES
154
Fig.10
END

Fig. 7

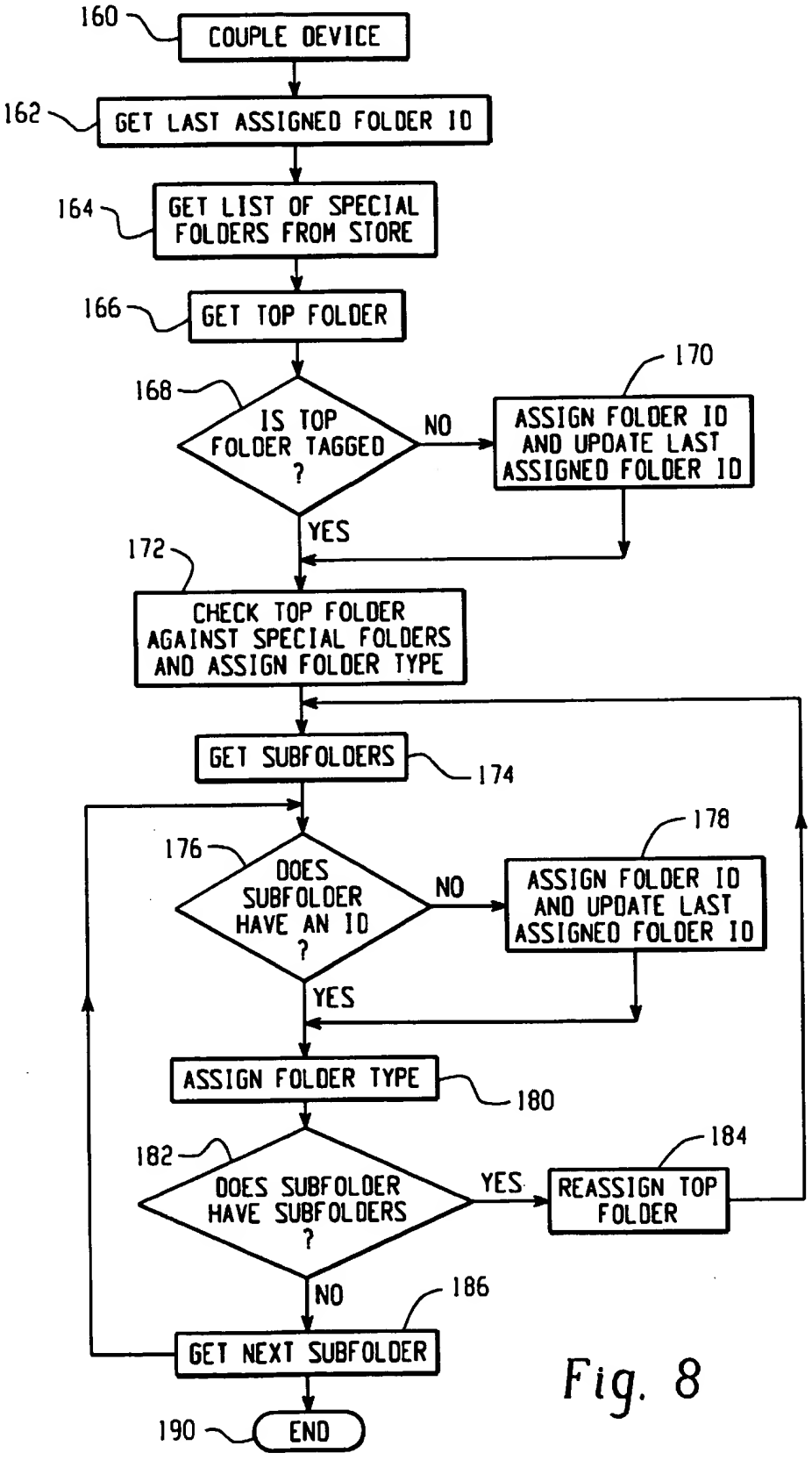

160
COUPLE DEVICE
162
GET LAST ASSIGNED FOLDER ID
164
GET LIST OF SPECIAL FOLDERS FROM STORE
166
GET TOP FOLDER
168
IS TOP FOLDER TAGGED ?
NO
170
ASSIGN FOLDER ID AND UPDATE LAST ASSIGNED FOLDER ID
YES
172
CHECK TOP FOLDER AGAINST SPECIAL FOLDERS AND ASSIGN FOLDER TYPE
GET SUBFOLDERS
174
176
DOES SUBFOLDER HAVE AN ID ?
NO
178
ASSIGN FOLDER ID AND UPDATE LAST ASSIGNED FOLDER ID
YES
ASSIGN FOLDER TYPE
180
182
DOES SUBFOLDER HAVE SUBFOLDERS ?
YES
184
REASSIGN TOP FOLDER
NO
186
GET NEXT SUBFOLDER
190
END

Fig. 8

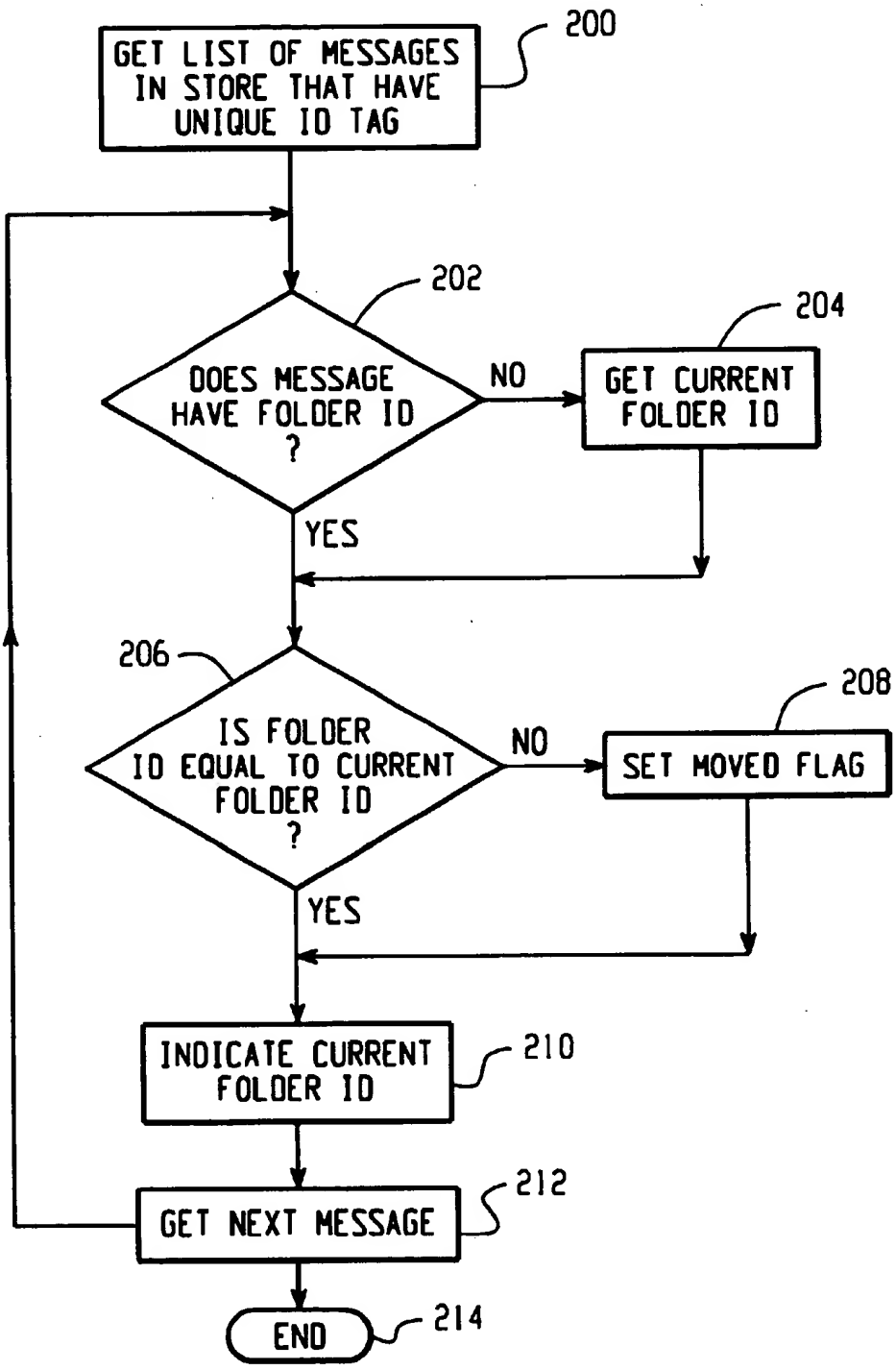

GET LIST OF MESSAGES IN STORE THAT HAVE UNIQUE ID TAG
200
DOES MESSAGE HAVE FOLDER ID ?
202
NO
GET CURRENT FOLDER ID
204
YES
IS FOLDER ID EQUAL TO CURRENT FOLDER ID ?
206
NO
SET MOVED FLAG
208
YES
INDICATE CURRENT FOLDER ID
210
GET NEXT MESSAGE
212
END
214

Fig. 9

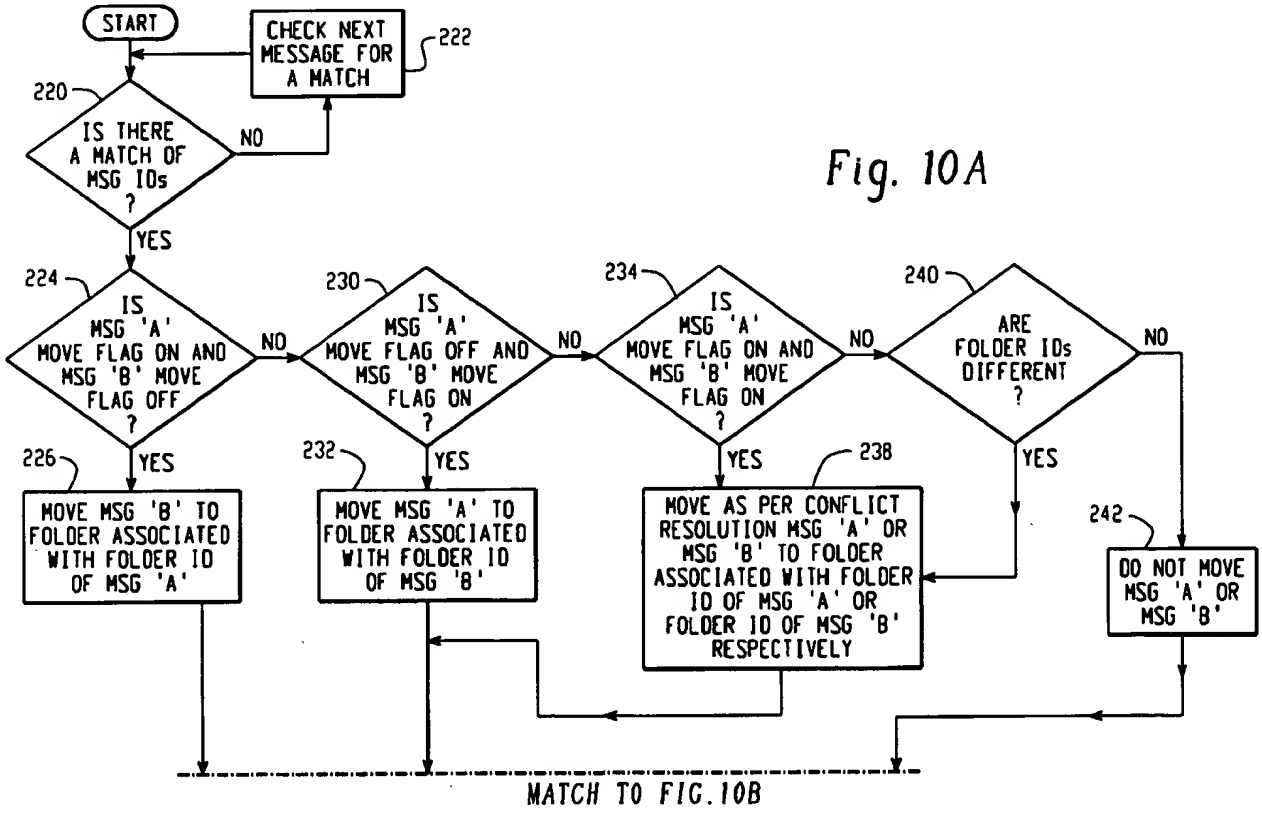

START
CHECK NEXT MESSAGE FOR A MATCH
222
220
IS THERE A MATCH OF MSG IDs ?
NO
YES
224
IS MSG 'A' MOVE FLAG ON AND MSG 'B' MOVE FLAG OFF ?
NO
230
IS MSG 'A' MOVE FLAG OFF AND MSG 'B' MOVE FLAG ON ?
NO
234
IS MSG 'A' MOVE FLAG ON AND MSG 'B' MOVE FLAG ON ?
NO
240
ARE FOLDER IDs DIFFERENT ?
NO
YES
226
MOVE MSG 'B' TO FOLDER ASSOCIATED WITH FOLDER ID OF MSG 'A'
232
MOVE MSG 'A' TO FOLDER ASSOCIATED WITH FOLDER ID OF MSG 'B'
238
MOVE AS PER CONFLICT RESOLUTION MSG 'A' OR MSG 'B' TO FOLDER ASSOCIATED WITH FOLDER ID OF MSG 'A' OR FOLDER ID OF MSG 'B' RESPECTIVELY
242
DO NOT MOVE MSG 'A' OR MSG 'B'
MATCH TO FIG.10B

Fig. 10A

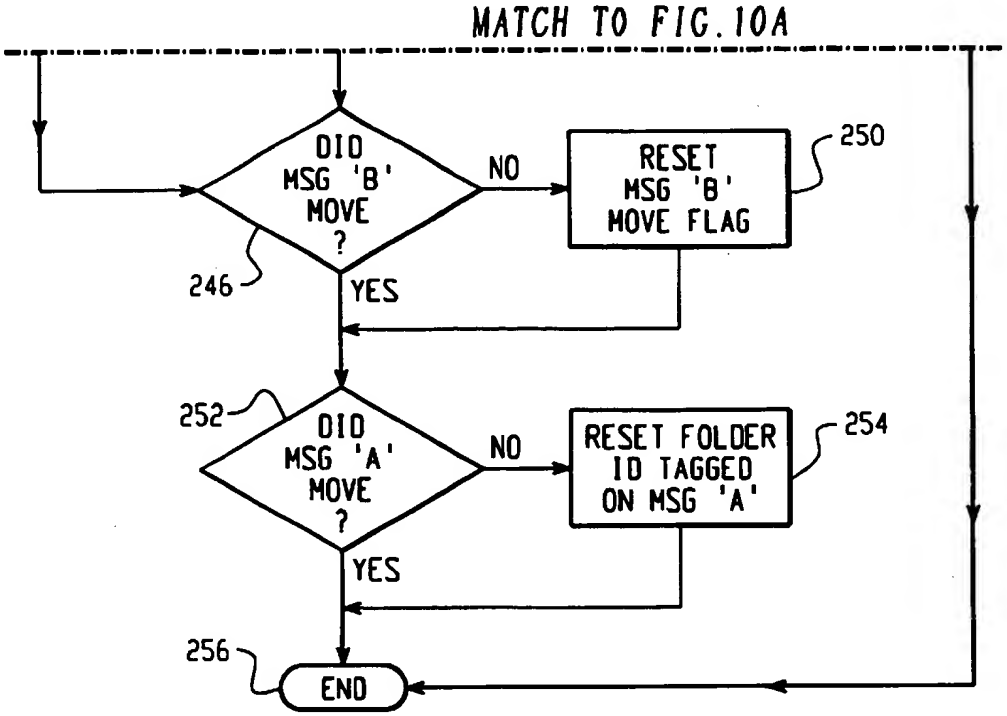


Fig. 10B

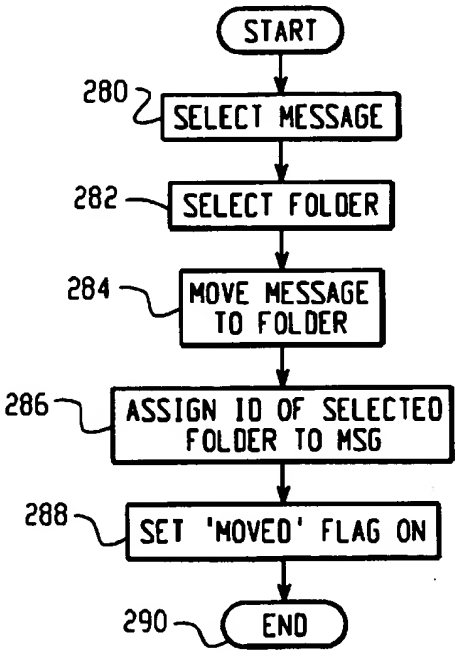


Fig. 12

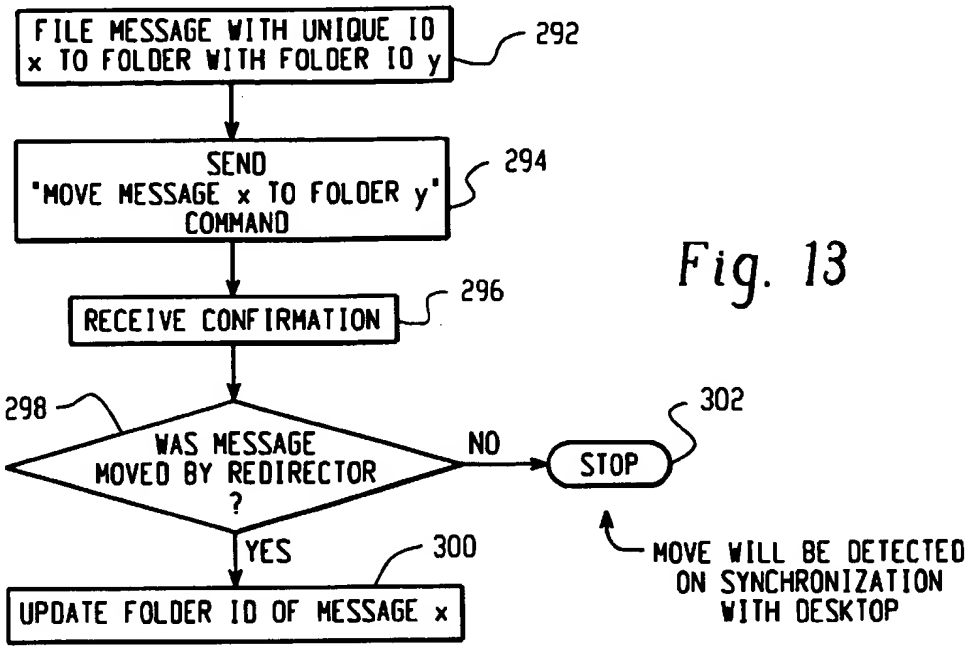

FILE MESSAGE WITH UNIQUE ID x TO FOLDER WITH FOLDER ID y
292
SEND "MOVE MESSAGE x TO FOLDER y" COMMAND
294
RECEIVE CONFIRMATION
296
298
WAS MESSAGE MOVED BY REDIRECTOR ?
NO
STOP
302
YES
300
UPDATE FOLDER ID OF MESSAGE x
MOVE WILL BE DETECTED ON SYNCHRONIZATION WITH DESKTOP

Fig. 13

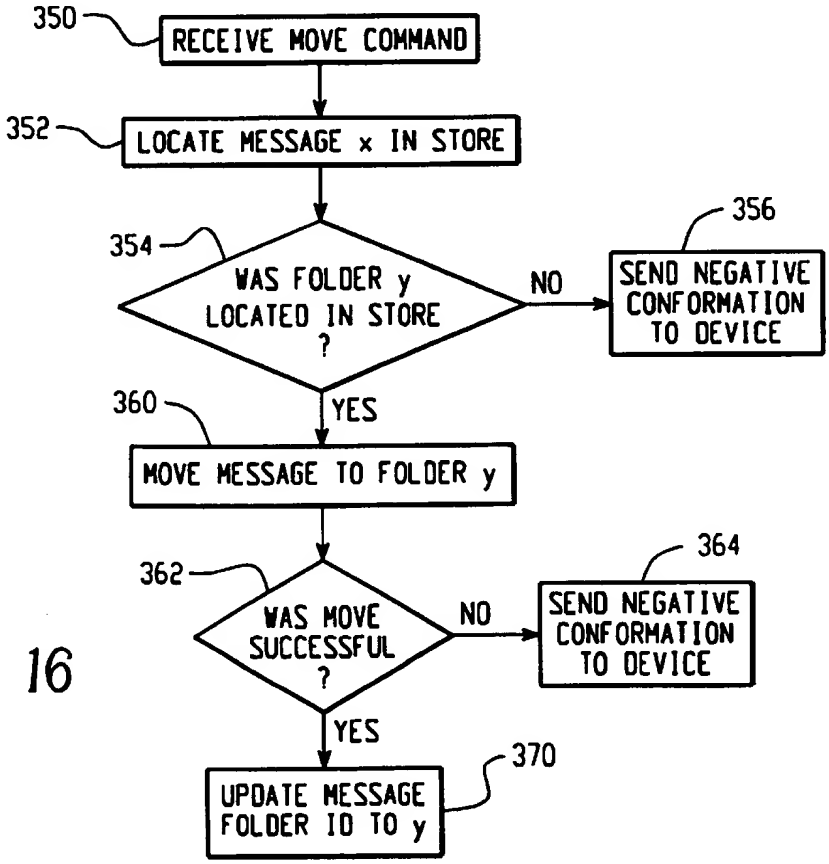

350
RECEIVE MOVE COMMAND
352
LOCATE MESSAGE x IN STORE
354
WAS FOLDER y LOCATED IN STORE ?
NO
356
SEND NEGATIVE CONFORMATION TO DEVICE
YES
360
MOVE MESSAGE TO FOLDER y
362
WAS MOVE SUCCESSFUL ?
NO
364
SEND NEGATIVE CONFORMATION TO DEVICE
YES
370
UPDATE MESSAGE FOLDER ID TO y

Fig. 16

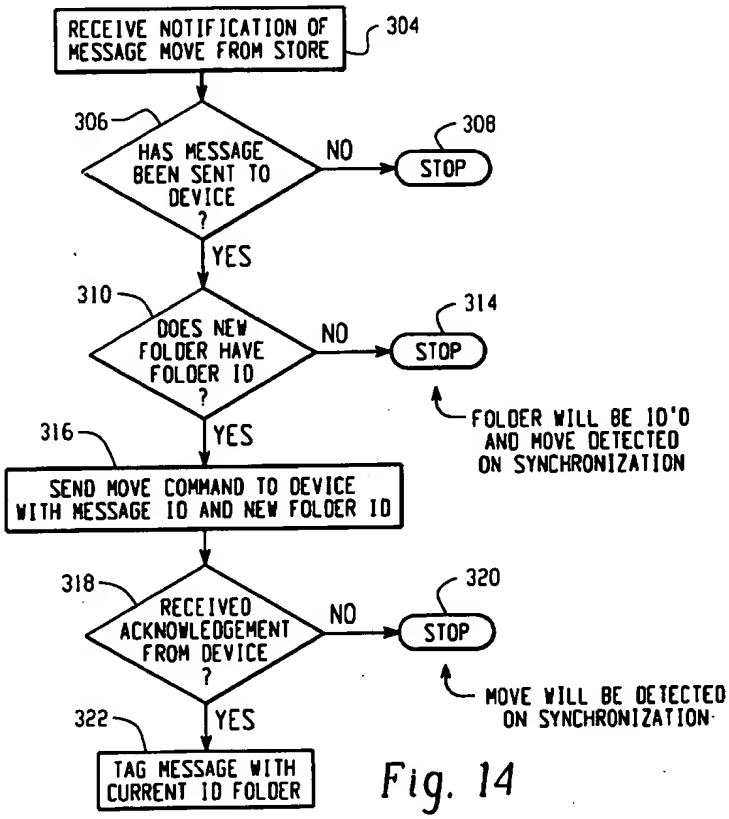

RECEIVE NOTIFICATION OF MESSAGE MOVE FROM STORE
304
306
HAS MESSAGE BEEN SENT TO DEVICE ?
NO
308
STOP
YES
310
DOES NEW FOLDER HAVE FOLDER ID ?
NO
314
STOP
FOLDER WILL BE ID'D AND MOVE DETECTED ON SYNCHRONIZATION
YES
316
SEND MOVE COMMAND TO DEVICE WITH MESSAGE ID AND NEW FOLDER ID
318
RECEIVED ACKNOWLEDGEMENT FROM DEVICE ?
NO
320
STOP
MOVE WILL BE DETECTED ON SYNCHRONIZATION
YES
322
TAG MESSAGE WITH CURRENT ID FOLDER

Fig. 14

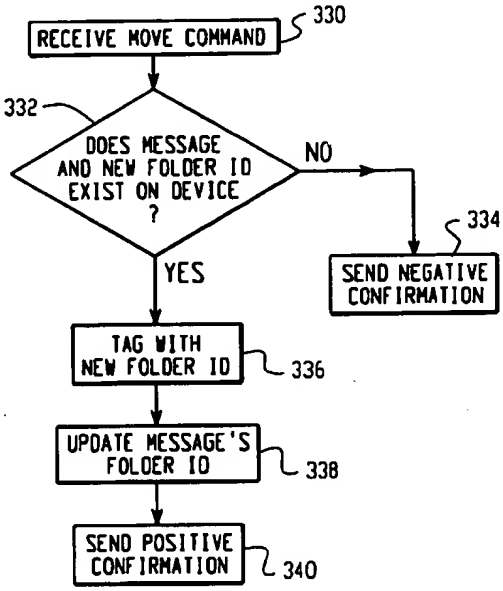

RECEIVE MOVE COMMAND
330
332
DOES MESSAGE AND NEW FOLDER ID EXIST ON DEVICE ?
NO
334
SEND NEGATIVE CONFIRMATION
YES
TAG WITH NEW FOLDER ID
336
UPDATE MESSAGE'S FOLDER ID
338
SEND POSITIVE CONFIRMATION
340

Fig. 15

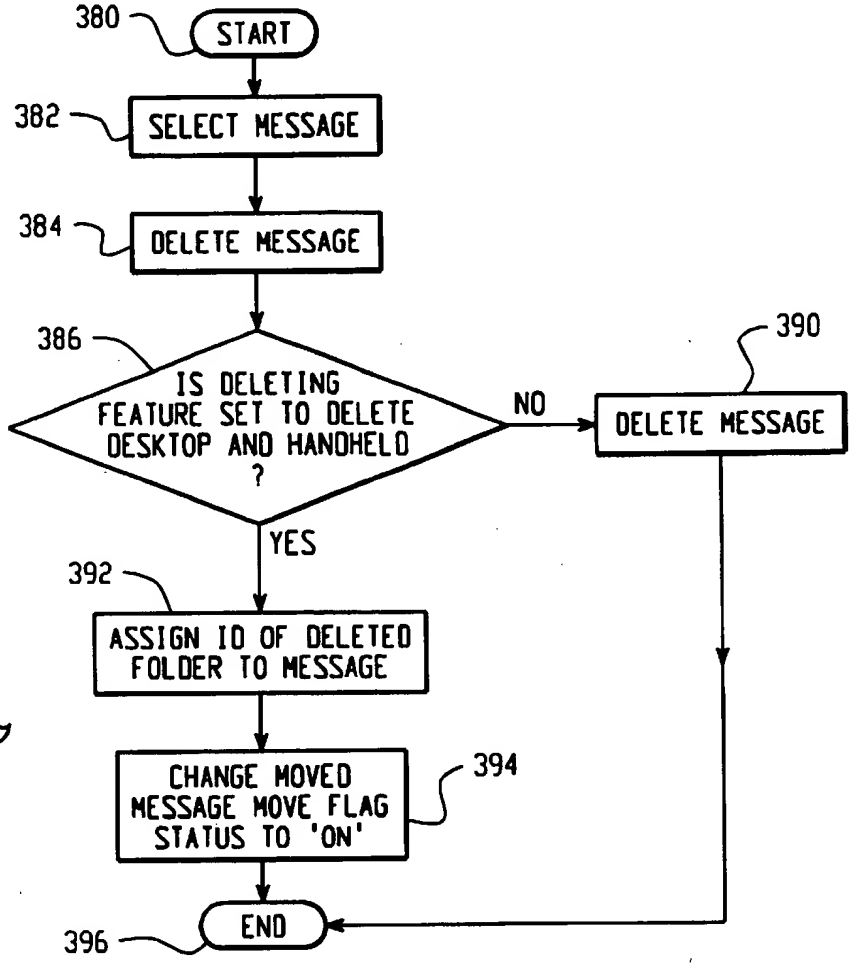

380
START
382
SELECT MESSAGE
384
DELETE MESSAGE
386
IS DELETING FEATURE SET TO DELETE DESKTOP AND HANDHELD ?
NO
390
DELETE MESSAGE
YES
392
ASSIGN ID OF DELETED FOLDER TO MESSAGE
CHANGE MOVED MESSAGE MOVE FLAG STATUS TO 'ON'
394
END
396

Fig. 17

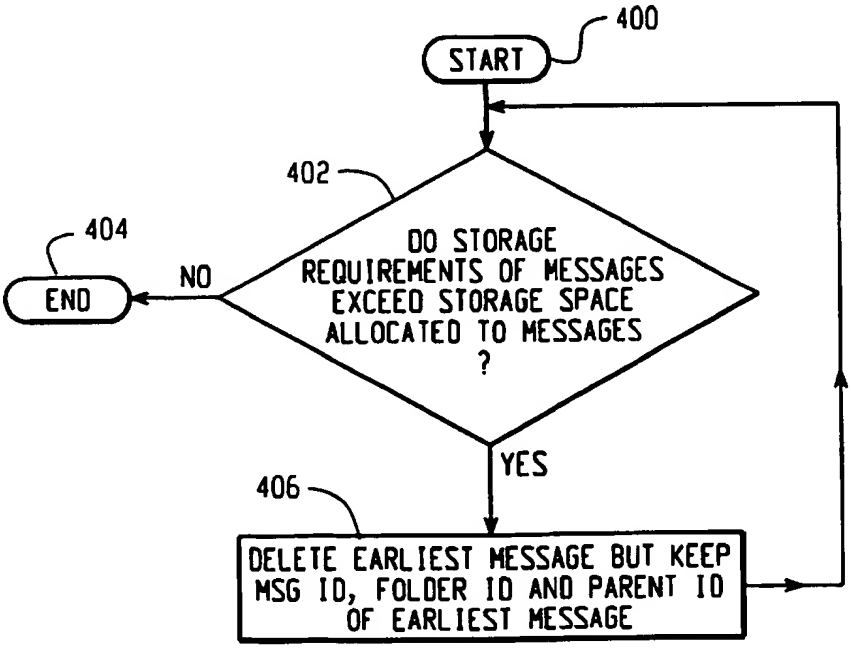

400
START
402
DO STORAGE REQUIREMENTS OF MESSAGES EXCEED STORAGE SPACE ALLOCATED TO MESSAGES ?
NO
404
END
YES
406
DELETE EARLIEST MESSAGE BUT KEEP MSG ID, FOLDER ID AND PARENT ID OF EARLIEST MESSAGE

Fig. 18

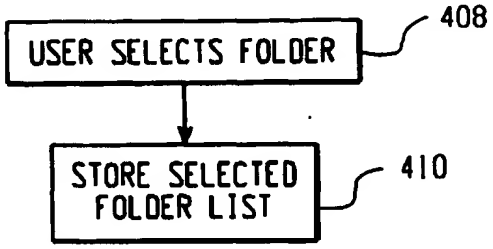

USER SELECTS FOLDER
408
STORE SELECTED FOLDER LIST
410

Fig. 19

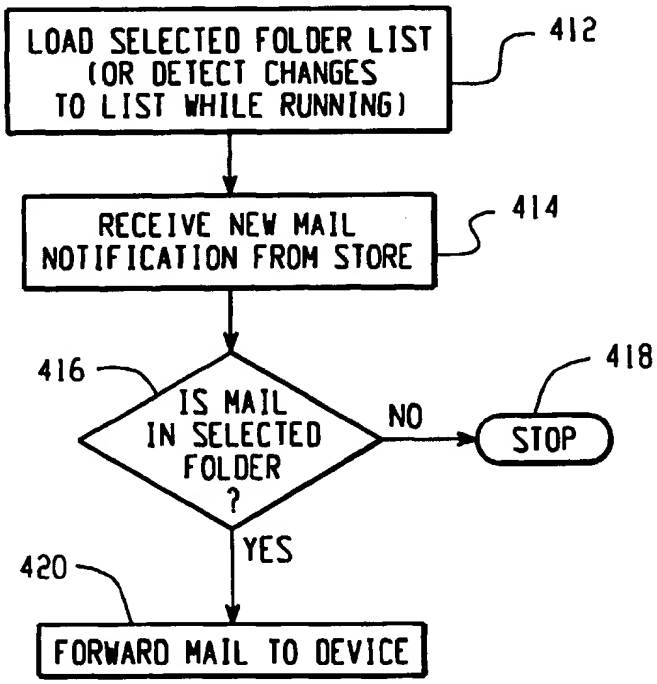

LOAD SELECTED FOLDER LIST (OR DETECT CHANGES TO LIST WHILE RUNNING)
412
RECEIVE NEW MAIL NOTIFICATION FROM STORE
414
416
IS MAIL IN SELECTED FOLDER ?
NO
418
STOP
YES
420
FORWARD MAIL TO DEVICE

Fig. 20

SYSTEM AND METHOD FOR PUSHING INFORMATION FROM A HOST SYSTEM TO A MOBILE DATA COMMUNICATION DEVICE

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of U.S. Utility application Ser. No. 09/087,623, entitled System and Method for Pushing Information from a Host System to a Mobile Data Communication Device, filed May 29, 1998, and assigned to the assignee of the present invention now U.S. Pat. No. 6,219,694.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention is directed toward the field of replicating (or synchronizing) information from a host system where the information is normally stored to a mobile data communication device. More specifically, the system and method of the present invention provide an event-driven redirection computer program ("redirector program") operating at the host system, which, upon sensing a particular user-defined event has occurred, redirects user-selected data items from the host system to the user's mobile data communication device. Upon receiving this redirected information at their mobile device, the user can then organize this data into hierarchies, commonly known as folders, and may also perform various other operations on the redirected data. These organizational and other operations are then synchronized back to the original host system for replication. The invention also provides for the synchronization of a storage representation model for storing the data in a hierarchy of folders at the host system and the mobile device.

Instead of warehousing (or storing) the user's data items at the host system and then "synchronizing" the mobile data communication device to data items stored at the host system when the mobile device requests that such items of information be communicated to it, the present invention employs a "push" paradigm that continuously packages and retransmits the user-selected items of information to the mobile data communication device in response to a triggering event detected at the host system. Wireless mobile data communications devices, especially those that can return a confirmation signal to the host that the pushed data has been received are especially well suited for this type of push paradigm.

Once the information is pushed to the device, the user can then read the information and 'file' the information into its appropriate folder based on the contents of the information. Alternatively, the user can perform some other operation on the information. These operations, as well as the user's folder hierarchy for storing information at the mobile device, are then replicated back (synchronized) to the host system, which then automatically organizes the user's information into the same folder hierarchies (or replicates the other operations performed at the mobile device), thus saving the user from doing the action a second time at the host system. The synchronization of the message operations can be carried in real-time as the operations are being executed at the mobile device, or in a batch process when the mobile device is electrically coupled to the host system.

2. Description of the Related Art

Present systems and methods for replicating information from a host system to a user's mobile data communication

device are typically "synchronization" systems in which the user's data items are warehoused (or stored) at the host system for an indefinite period of time and then transmitted in bulk only in response to a user request. In these types of systems and methods, when replication of the warehoused data items to the mobile device is desired, the user typically places the mobile device in an interface cradle that is electrically connected to the host system via some form of local, dedicated communication, such as a serial cable or an infrared or other type of wireless link. Alternatively, the user might have to perform a special 'connection' action every so often that will synchronous all the pending items required by the user, provided they remember. Software executing on the mobile data communication device then transmits commands via the local communications link or a network link to the host system to cause the host to begin transmitting the user's data items for storage in a memory bank of the mobile device. In these synchronization schemes, the mobile unit "pulls" the warehoused information from the host system in a batch each time the user desires to replicate information between the two devices. Therefore, the two systems (host and mobile) only maintain the same data items after a user-initiated command sequence that causes the mobile device to download the data items from the host system.

Another major problem with the current pull-based systems is that the user must deal with the information all over again once the user returns to his office and accesses the information store at the host system. This situation occurs because the average user can get hundreds of pieces of electronic information a day. This is very common in e-mail systems where internal company mail, and external Internet mail, merge into one common mailbox creating a multitude of sources all merged into one location. As a result, once the user returns to their office, even though they may have seen and read the mail while traveling on their mobile device, they still have to re-read the messages and then organize the information into folders based upon the content. This results in user frustration, as the mobile device has not solved the problem of saving them time when the user returns to his office and accesses the information store at the host system.

A general problem with these known synchronization systems is that the only time that the user data items are replicated between the host system and the mobile data communication device is when the user commands the mobile device to download or pull the user data from the host system. Five minutes later a new message could be sent to the user, but the user would not receive that message until the next time the user fetches the user data items. Thus, a user may fail to respond to an emergency update or message because the user only periodically synchronizes the system, such as once per day.

Other problems with these systems include: (1) the amount of data to be reconciled between the host and the mobile device can become large if the user does not "synchronize" on a daily or hourly basis, leading to bandwidth difficulties, particularly when the mobile device is communicating via a wireless packet-switched network; (2) reconciling large amounts of data, as can accrue in these batch-mode synchronization systems, can require a great deal of communication between the host and the mobile device, thus leading to a more complex, costly and energy-inefficient system; and (3) the need to deal with the information a second time once the user returns to the office and accesses the information store at the host system. A more automated, continuous, efficient and reliable system of ensuring that user data items are replicated (synchronized) at the user's mobile device is therefore needed.

SUMMARY OF THE INVENTION

A system and method of pushing user-selected data items from a host system to a user's mobile data communication device upon detecting the occurrence of one or more user-defined event triggers is provided. The user may then move (or file) the data items to a particular folder within a folder hierarchy stored in the mobile data communication device, or may execute some other system operation on the data item. Software operating at the mobile device and the host system then synchronizes the folder hierarchy of the mobile device with a folder hierarchy of the host system, and any actions executed on the data items at the mobile device are then automatically replicated on the same data items stored at the host system, thus eliminating the need for the user to manually replicate actions at the host system that have been executed at the mobile data communication device.

As used in this application, the term host system refers to the computer where the redirector software is operating. In the preferred embodiment of the present invention, the host system is a user's desktop PC, although, alternatively, the host system could be a network server connected to the user's PC via a local-area network ("LAN"), or could be any other system that is in communication with the user's desktop PC.

A redirector program operating at the host system enables the user to redirect or mirror certain user-selected data items (or parts of data items) from the host system to the user's mobile data communication device upon detecting that one or more user-defined triggering events has occurred. Once the data items are redirected to the user's mobile data communication device, the user may then organize and sort the items into folder hierarchies that are replicated at the host system. Once the user acts upon the redirected data items, such as by reading, organizing, replying or forwarding the data item from the mobile data communication device, the host system is then informed of these actions and automatically reflects the changes on the corresponding data item stored at the host system.

Operating at the host system are various sub-systems that can be configured to create triggering events, such as a screen saver sub-system or a keyboard sub-system, as well as sub-systems for repackaging the user's data items for transparent delivery to the mobile data device, such as a TCP/IP sub-system or one or more E-Mail sub-systems. Other sub-systems for creating triggering events and repackaging the user's data items could also be present at the host system. The host system also includes a primary memory store where the user's data items are normally stored with related information as to which folder the message might have originally been placed into.

Using the redirector program, the user can select certain data items for redirection, such as E-mail messages, calendar events, meeting notifications, address entries, journal entries, personal reminders, etc. The user can also select which folders get redirected to the mobile device. For example, the user may select that only data items in the Inbox and those in the company X folder shall be sent to the device. Having selected the data items for redirection, the user can then configure one or more event triggers to be sensed by the redirector program to initiate redirection of the user data items. These user-defined trigger points (or event triggers) include external events, internal events and networked events.

Examples of external events include: receiving a message from the user's mobile data communication device to begin redirection; receiving a similar message from some external computer; sensing that the user is no longer in the vicinity of the host system; or any other event that is external to the host system. Internal events could be a calendar alarm, screen saver activation, keyboard timeout, programmable timer, or any other user-defined event that is internal to the host system. Networked events are user-defined messages that are transmitted to the host system from another computer coupled to the host system via a network to initiate redirection. These are just some of the examples of the types of user-defined events that can trigger the redirector program to push data items from the host to the mobile device.

In addition to the functionality noted above, the redirector program provides a set of software-implemented control functions for determining the type of mobile data communication device and its address, for programming a preferred list of message types or folder names that are to be redirected, and for determining whether the mobile device can receive and process certain types of message attachments, such as word processor or voice attachments. The determination of whether a particular mobile device can receive and process attachments is initially configured by the user of that mobile device at the host system. This configuration can then be altered on a global or per message basis by transmitting a command message from the mobile device to the host system. If the redirector is configured so that the mobile data device cannot receive and process word processor or voice attachments, then the redirector routes these attachments to an external machine that is compatible with the particular attachment, such as a networked printer or fax machine or telephone. Other types of attachments could be redirected to other types of external machines in a similar fashion, depending upon the capabilities of the mobile device. For example, if a user is traveling and receives a message with an attachment that the user's mobile device can process or display, the user may from a mobile communications device send a command message to the host system indicating that that attachment is to be sent to a fax machine at a hotel where the user will be spending the evening. This enables the user to receive important E-mail attachments as long as the host system is provided with sufficient information about the destination where the attachment is to be forwarded.

Once an event has triggered redirection of the user data items, the host system then repackages these items in a manner that is transparent to the mobile data communication device, so that information on the mobile device appears similar to information on the user's host system. In additional to repackaging the information itself, the repackaging may also include properties about the message. This might include the folder from which the message has been detected and pushed to the device. The preferred repackaging method includes wrapping the user data items in an E-mail envelope that corresponds to the address of the mobile data communication device, although, alternatively, other repackaging methods could be used with the present invention, such as special-purpose TCP/IP wrapping techniques, or other methods of wrapping the user selected data items. The repackaging preferably results in E-mail messages appearing to come from the host system even though they are initiated at the mobile device, thus enabling the user to appear to have a single E-mail address, such that the recipients of messages sent from the mobile communications device do not know where the user was physically located when the message was first sent. The repackaging also permits both messages to the mobile device and sent from the mobile device to be encrypted and decrypted as well as compressed and decompressed.

In an alternative system and method, the redirector program executes on a network server, and the server is programmed to detect numerous redirection event triggers over the network from multiple user desktop computers coupled to the server via a LAN. The server can receive internal event triggers from each of the user desktops via the network, and can also receive external event triggers, such as messages from the users' mobile data communication devices. In response to receiving one of these triggers, the server redirects the user's data items to the proper mobile data communication device. The user data items and addressing information for a particular mobile device can be stored at the server or at the user's PC. Using this alternative configuration, one redirector program can serve a plurality of users. This alternative configuration could also include an internet- or intranet-based redirector program that could be accessible through a secure webpage or other user interface. The redirector program could be located on an Internet Service Provider's system and accessible only through the Internet.

In another alternative configuration of the present invention, a redirector program operates at both the host system and at the user's mobile data communication device. In this configuration, the user's mobile device operates similarly to the host system described below, and is configured in a similar fashion to push certain user-selected data items from the mobile device to the user's host system (or some other computer) upon detecting an event trigger at the mobile device. This configuration provides two-way pushing of information from the host to the mobile device and from the mobile device to the host.

Wireless mobile data communications devices, especially those that can return a confirmation signal to the host that the pushed data has been received, are especially well suited for this type of push paradigm. It is also possible for the mobile data communications device to include additional information with the confirmation signal, including, any one or more of the following actions, the fact that the message: has been read (the information associated therewith is a "read signal"); has been filed in a specific folder (the information associated therewith is a "filed signal"); has been forwarded to another recipient (the information associated therewith is a "forward signal"); or, has been replied to (the information associated therewith is a "reply signal"). These actions can then be synchronized with the host system, thus eliminating the need for the user to perform these actions a second time. The action signals may advantageously be used to indicate the state of the message at the mobile.

One aspect of the invention, therefore, provides a method of indicating at the host system the state of the message at the mobile communications device. The steps of this method preferably include: (A) altering the state of a first message at the mobile communications device thereby creating an altered state; (B) forwarding a status signal to the host system; and, (C) changing at the host system a first message status icon based on the altered state at the mobile communications device. Therefore, according to one aspect of the invention, the message status icon change indicates an altered state of the message at the mobile communication device.

One aspect of the invention, therefore, provides a method of indicating at the host system the state of the message at the mobile communications device. The steps of this method preferably include: (A) redirecting a first message from the host system to the mobile communications device, wherein the first message at the host system has a first message status icon; (B) receiving the redirected first message from the host system at the mobile communications device; (C) altering the state of the first message at the mobile communications device thereby creating an altered state; (D) forwarding a status signal to the host system; and, (E) changing at the host system the first message status icon based on the action taken at the mobile communications device.

One aspect of the invention provides a method of indicating at a first device, via the host system, the state of the message at the mobile communications device. The steps of this method preferably include: (A) redirecting a first message from the host system to the mobile communications device, wherein the first message at the host system has a first message status icon; (B) receiving the redirected first message from the host system at the mobile communications device; (C) altering the state of the first message at the mobile communications device thereby creating an altered state; (D) forwarding a status signal to the host system; and, (E) changing at the host system the first message status icon based on the action taken at the mobile communications device; and (F) forwarding a read-receipt to a read-receipt requester's device.

One aspect of the invention provides a method of synchronizing messages between a first system and a second system. The steps of this method preferably include: (A) retrieving a first folder hierarchy from the first system; (B) retrieving a second folder hierarchy from the second system; (C) synchronizing the second folder hierarchy to the first folder hierarchy; (D) retrieving a first plurality of messages from the first system, the first plurality of messages being stored in folders within the first folder hierarchy; (E) retrieving a second plurality of messages from the second system, the second plurality of messages being stored in folders within the second folder hierarchy; (F) comparing the first plurality of messages to the second plurality of messages to identify common messages stored in both the first and second folder hierarchies; (G) determining whether any of the common messages are stored in different folders in the first and second folder hierarchies; and (H) if a common message is located in different folders of the first and second folder hierarchies, then synchronizing the messages by moving the common message to a new folder within the first folder hierarchy or by moving the common message to a new folder within the second folder hierarchy.

Another aspect of the invention provides a method of synchronizing messages stored in a folder hierarchy at a host system and a corresponding folder hierarchy at a mobile data communication device. This method preferably includes the following steps: (A)receiving a message at the host system; (B) storing the message in a first folder of the folder hierarchy at the host system; (C) transmitting the message to the mobile data communication device; (D) storing the message in a first folder of the folder hierarchy at the mobile data communication device; (E) moving the message from the first folder to a second folder at the mobile data communication device; (F) coupling the mobile data communication device to the host system; (G) detecting that the message has been moved to the second folder at the mobile data communication device; and (H) in response to the detection step, moving the message from the first folder at the host system to a second folder of the folder hierarchy at the host system that corresponds to the second folder of the folder hierarchy at the mobile data communication device.

Still another aspect of the invention provides a method of synchronizing messages stored in a folder hierarchy at a host system and a corresponding folder hierarchy at a mobile data communication device, comprising the steps of: (A) receiving a message at the host system; (B) storing the message in

a first folder of the folder hierarchy at the host system; (C) transmitting the message to the mobile data communication device; (D) storing the message in a first folder of the folder hierarchy at the mobile data communication device; (E) moving the message from the first folder to a second folder at the mobile data communication device; (F) transmitting a move message from the mobile data communication device to the host system indicating that the message has been moved to the second folder at the mobile data communication device; and (G) receiving the move message at the host system and moving the message stored in the first folder at the host system to a second folder at the host system that corresponds to the second folder at the mobile data communication device.

Yet another aspect of the invention provides a method of synchronizing a first device to a second device, comprising the steps of: (A) providing a first folder hierarchy at the first device; (B) providing a second folder hierarchy at the second device; (C) synchronizing the second folder hierarchy to the first folder hierarchy; (D) retrieving a first plurality of messages stored within the first folder hierarchy and retrieving a second plurality of messages stored within the second folder hierarchy, wherein at least one of the first plurality of messages and at least one of the second plurality of messages are common messages; (E) determining whether the common messages are stored in similar folders within the first and second folder hierarchies; and (F) if the common messages are not stored in similar folders, then synchronizing the common messages so that they are stored in similar folders within the first and second folder hierarchies.

Another aspect of the invention provides a method of synchronizing a first device to a second device, comprising the steps of: (A) providing a first folder hierarchy at the first device; (B) providing a second folder hierarchy at the second device; (C) retrieving a first plurality of messages stored within the first folder hierarchy and retrieving a second plurality of messages stored within the second folder hierarchy; (D) determining whether the first device executed an operation on a message stored in the first folder hierarchy, and if so, then executing the same operation on a corresponding message stored in the second folder hierarchy at the second device.

Still another aspect of the invention provides a system for synchronizing messages between a first device and a second device, comprising: a pair of matching folders, one of the pair of matching folders being located on the first device, the other of the pair of matching folders being located on the second device; a pair of matching messages, one of the pair of matching messages being located on the first device, the other of the pair of matching messages being located on the second device; and means for moving the pair of messages such that if one of the pair of matching messages is moved to one of the pair of matching folders, the other matching message is moved to the other matching folder.

An advantage of the present invention is that it provides a system and method for triggering the continuous and real-time redirection of user-selected data items from a host system to a mobile data communication device. Other advantages of the present invention include: (1) flexibility in defining the types of user data to redirect, and in defining a preferred list of message types and folder names that are to be redirected or preferred senders whose messages are to be redirected; (2) flexibility in configuring the system to respond to numerous internal, external and networked triggering events; (3) transparent repackaging of the user data items in a variety of ways such that the mobile data communication device appears as though it were the host system; (4) integration with other host system components such as E-mail, TCP/IP, keyboard, screen saver, webpages and certain programs that can either create user data items or be configured to provide trigger points; (5) the ability to operate locally on a user's desktop system or at a distance via a network server; (6) the ability to store folder hierarchies on the mobile data communications device so that user can organize the information during those periods when information is being redirected to said device; and (7) eliminating the need to organize the information a second time once the user returns to the office to work from their host system.

A further advantage of the present invention is that it provides a software structure and method for managing messages between the mobile data communication device and the host system. The software provides a logical structure for folders and messages that can detect movement of messages between folders on either the mobile data communication device or the host system. This allows the user the flexibility to organize messages into folders on the mobile data communication device without having to replicate the organizational work on the host system, or vice versa. The folder and message software structure further provides the redirector program trigger signals for forwarding messages.

These are just a few of the many advantages of the present invention, as described in more detail below. As will be appreciated, the invention is capable of other and different embodiments, and its several details are capable of modifications in various respects, all without departing from the spirit of the invention. Accordingly, the drawings and description of the preferred embodiments set forth below are to be regarded as illustrative in nature and not restrictive.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a system diagram showing the redirection of user data items from a user's desktop PC (host system) to the user's mobile data communication device, where the redirector software is operating at the user's desktop PC.

FIG. **2** is a system diagram showing the redirection of user data items from a network server (host system) to the user's mobile data communication device, where the redirector software is operating at the server.

FIG. **3** is a block diagram showing the interaction of the redirector software with other components of the host system in FIG. **1** (the user's desktop PC) to enable the pushing of information from the host system to the user's mobile data communication device.

FIG. **4** is a flow chart showing the steps carried out by the redirector software operating at the host system.

FIG. **5** is a flow chart showing the steps carried out by the mobile data communication device to interface with the redirector software operating at the host system.

FIG. **6** is a schematic diagram of the logical structure of a folder and a message.

FIG. **7** is a flow chart showing the steps of synchronizing folders and messages between the host system and the mobile data communication device.

FIG. **8** is a flow chart showing the steps of assigning IDs to folders.

FIG. **9** is a flow chart showing the steps of retrieving messages from the store.

FIGS. **10** A and B is a flow chart more specifically showing the steps of synchronizing messages between the host system and the mobile data communication device.

FIG. 11 is a flow chart showing the steps of attaching a folder ID to a message.

FIG. 12 is a flow chart showing the steps of moving a message locally on a device.

FIG. 13 is a flow chart showing the steps of sending a move message to the host system after a message has been moved on the mobile device.

FIG. 14 is a flow chart showing the steps of sending a move message from the host system to the mobile device after a message has been moved on the host system.

FIG. 15 is a flow chart showing the steps of acting upon the move message command of FIG. 13 at the device.

FIG. 16 is a flow chart showing the steps of acting upon the message move command of FIG. 14.

FIG. 17 is a flow chart showing the steps of deleting a message.

FIG. 18 is a flow chart showing the steps of purging a message.

FIG. 19 is a flow chart showing the steps of generating a folder list for redirecting messages received at a store.

FIG. 20 is a flow chart showing the steps of redirecting a message received and filed in the folder list of FIG. 19.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring now to the drawings, FIG. 1 is an example system diagram showing the redirection of user data items (such as message A or C) from a user's office PC (host system) 10 to the user's mobile data communication device 24, where the redirector software 12 is operating at the user's PC. Message A in FIG. 1 represents an internal message sent from desktop 26 to the user's host system 10 via LAN 14. Message C in FIG. 1 represents an external message from a sender that is not directly connected to LAN 14, such as the user's mobile data communication device 24, some other user's mobile device (not shown), or any user connected to the Internet 18. Message C also represents a command message from the user's mobile data communication device 24 to the host system 10. As described in more detail in FIG. 3, the host system 10 preferably includes, along with the typical hardware and software associated with a workstation or desktop computer, the redirector program 12, a TCP/IP subsystem 42, a primary message store 40, an E-mail subsystem 44, a screen saver subsystem 48, and a keyboard subsystem 46.

In FIG. 1, the host system 10 is the user's desktop system, typically located in the user's office. The host system 10 is connected to a LAN 14, which also connects to other computers 26, 28 that may be in the user's office or elsewhere. The LAN 14, in turn, is connected to a wide area network ("WAN") 18, preferably the Internet, which is defined by the use of the Transmission Control Protocol/Internet Protocol ("TCP/IP") to exchange information, but which, alternatively could be any other type of WAN. The connection of the LAN 14 to the WAN 18 is via high bandwidth link 16, typically a T1 or T3 connection. The WAN 18, in turn, is connected to a variety of gateways 20, via connections 32. A gateway forms a connection or bridge between the WAN 18 and some other type of network, such as an RF wireless network, cellular network, satellite network, or other synchronous or asynchronous land-line connection.

In the example of FIG. 1, a wireless gateway 20 is connected to the Internet for communicating via wireless link 22 to a plurality of wireless mobile data communication devices 24. Also shown in FIG. 1 is machine 30, which could be a FAX machine, a printer, a system for displaying images (such as video) or a machine capable of processing and playing audio files, such as a voice mail system. The present invention includes the ability to redirect certain message attachments to such an external machine 30 if the redirector program configuration data reflects that the mobile device 24 cannot receive and process the attachments, or if the user has specified that certain attachments are not to be forwarded to mobile device 24, even if such device can process those attachments. By way of example, consider an E-mail sent to a user that includes three attachments—a word processing document, a video clip and an audio clip. The redirection program could be configured to send the text of the E-mail to the remote device, to send the word processing document to a networked printer located near the user, to send the video clip to a store accessible through a secure connection through the Internet, and to send the audio clip to the user's voice mail system. This example is not intended to limit the breadth and scope of the invention, but rather to illustrate the variety of possibilities embodied in the redirection concept.

The preferred mobile data communication device 24 is a hand-held two-way wireless paging computer, a wirelessly enabled palm-top computer, a mobile telephone with data messaging capabilities, or a wirelessly enabled laptop computer, but could, alternatively be other types of mobile data communication devices capable of sending and receiving messages via a network connection 22. Although it is preferable for the system to operate in a two-way communications mode, certain aspects of the invention could be beneficially used in a "one and one-half" or acknowledgment paging environment, or even with a one-way paging system. The mobile data communication device 24 includes software program instructions that work in conjunction with the redirector program 12 to enable the seamless, transparent redirection of user-selected data items. FIG. 4 describes the basic method steps of the redirector program 12, and FIG. 5 describes the steps of the corresponding program operating at the mobile device 24.

In an alternative embodiment of the present invention, not explicitly shown in the drawings, the mobile device 24 also includes a redirector program. In this embodiment, user selected data items can be replicated from the host to the mobile device and vice versa. The configuration and operation of the mobile device 24 having a redirector program is similar to that described herein with respect to FIGS. 1–4.

A user of the present invention can configure the redirector program 12 to push certain user-selected data items to the user's mobile data communication device 24 when the redirector 12 detects that a particular user-defined event trigger (or trigger point) has taken place. User-selected data items preferably include E-mail messages, calendar events, meeting notifications, address entries, journal entries, personal alerts, alarms, warnings, stock quotes, news bulletins, etc., but could, alternatively, include any other type of message that is transmitted to the host system 10, or that the host system 10 acquires through the use of intelligent agents, such as data that is received after the host system 10 initiates a search of a database or a website or a bulletin board. In some instances, only a portion of the data item is transmitted to the mobile device 24 in order to minimize the amount of data transmitted via the wireless network 22. In these instances, the mobile device 24 can optionally send a command message to the host system to receive more or all of the data item if the user desires to receive it.

The user-defined event triggers that can be detected by the redirector program 12 preferably include external events, internal events and networked events. External events pref-

erably include: (1) receiving a command message (such as message C) from the user's mobile data communication device to begin redirection, or to execute some other command at the host, such as a command to enable the preferred list mode, or to add or subtract a particular sender from the preferred list; (2) receiving a similar message from some external computer; and (3) sensing that the user is no longer in the vicinity of the host system; although, alternatively, an external event can be any other detectable occurrence that is external to the host system. Internal events could be a calendar alarm, screen saver activation, keyboard timeout, programmable timer, or any other user-defined event that is internal to the host system. Networked events are user-defined messages that are transmitted to the host system from another computer coupled to the host system via a network to initiate redirection. These are just some of the events that could be used with the present invention to initiate replication of the user-selected data items from the host system **10** to the mobile device **24**.

FIG. **1** shows an E-mail message A being communicated over LAN **14** from computer **26** to the user's desktop system **10** (also shown in FIG. **1** is an external message C, which could be an E-mail message from an Internet user, or could be a command message from the user's mobile device **24**). Once the message A (or C) reaches the primary message store of the host system **10**, it can be detected and acted upon by the redirection software **12**. The redirection software **12** can use many methods of detecting new messages. The preferred method of detecting new messages is using Microsoft's® Messaging API (MAPI), in which programs, such as the redirector program **12**, register for notifications or 'advise syncs' when changes to a mailbox take place. Other methods of detecting new messages could also be used with the present invention.

Assuming that the redirector program **12** is activated, and has been configured by the user (either through the sensing of an internal, network or external event) to replicate certain user data items (including messages of type A or C) to the mobile device **24**, when the message A is received at the host system **10**, the redirector program **12** detects its presence and prepares the message for redirection to the mobile device **24**. In preparing the message A for redirection, the redirector program **12** could compress the original message A, could compress the message header, or could encrypt the entire message A to create a secure link to the mobile device **24**.

Also programmed into the redirector **12** is the address of the user's mobile data communication device **24**, the type of device, and whether the device **24** can accept certain types of attachments, such as word processing or voice attachments. If the user's type of mobile device cannot accept these types of attachments, then the redirector **12** can be programmed to route the attachments to a fax or voice number where the user is located using an attached fax or voice machine **30**.

The redirector may also be programmed with a preferred list mode that is configured by the user either at the host system **10**, or remotely from the user's mobile data communication device by transmitting a command message C. The preferred list contains a list of senders (other users) whose messages are to be redirected or a list of message characteristics that determine whether a message is to be redirected. If activated, the preferred list mode causes the redirector program **12** to operate like a filter, only redirecting certain user data items based on whether the particular data item was sent from a sender on the preferred list or has certain message characteristics that if present will trigger or suppress redirection of the message.

In the example of FIG. **1**, if desktop system **26** was operated by a user on the preferred list of host system **10**, and the preferred list option was activated, then message A would be redirected. If, however, desktop **26** was operated by a user not on the host system's preferred list, then message A would not be redirected, even if the user of the host system had configured the redirector to push messages of type A. The user of the host system **10** can configure the preferred list directly from the desktop system, or, alternatively, the user can send a command message (such as C) from the mobile device **24** to the desktop system **10** to activate the preferred list mode, or to add or delete certain senders or message characteristics from the preferred list that was previously configured. It should be appreciated that a redirection program could combine message characteristics and preferred sender lists to result in a more finely-tuned filter. Messages marked as low priority or that are simple return receipts or message read receipts, for example, could always be suppressed from redirection while messages from a particular sender would always be redirected.

After the redirector has determined that a particular message should be redirected, and it has prepared the message for redirection, the software **12** then sends the message A to a secondary memory store located in the mobile device **24**, using whatever means are necessary. In the preferred embodiment this method is to send the message A back over the LAN **14**, WAN **18**, and through the wireless gateway **20** to the mobile data communication device **24**. In doing so, the redirector preferably repackages message A as an E-mail with an outer envelope B that contains the addressing information of the mobile device **24**, although alternative repackaging techniques and protocols could be used, such as a TCP/IP repackaging and delivery method (most commonly used in the alternative server configuration shown in FIG. **2**). The wireless gateway **20** requires this outer envelope information B in order to know where to send the redirected message A. Once the message (A in B) is received by the mobile device **24**, the outer envelope B is removed and the original message A is placed in the secondary memory store within the mobile device **24**. By repackaging and removing the outer envelope in this manner, the present invention causes the mobile computer **24** to appear to be at the same physical location as the host system **10**, thus creating a transparent system.

In the case where message C is representative of an external message from a computer on the Internet **18** to the host system **10**, and the host **10** has been configured to redirect messages of type C, then in a similar manner to message A, message C would be repackaged with an outer envelope B and transmitted to the user's mobile device **24**. In the case where message C is representative of a command message from the user's mobile device **24** to the host system **10**, then the command message C is not redirected, but is acted upon by the host system **10**.

If the redirected user data item is an E-mail message, as described above, the user at the mobile device **24** sees the original subject, sender's address, destination address, carbon copy and blind carbon copy. When the user replies to this message, or when the user authors a new message, the software operating at the mobile device **24** adds a similar outer envelope to the reply message (or the new message) to cause the message to be routed first to the user's host system **10**, which then removes the outer envelope and redirects the message to the final destination, such as back to computer **26**. In the preferred embodiment, this results in the outgoing redirected message from the user's host system **10** being sent using the E-mail address of the host mailbox, rather

than the address of the mobile device, so that it appears to the recipient of the message that the message originated from the user's desktop system **10** rather than the mobile data communication device. Any replies to the redirected message will then be sent to the desktop system **10**, which if it is still in redirector mode, will repackage the reply and resend it to the user's mobile data device, as described above.

FIG. **2** is an alternative system diagram showing the redirection of user data items from a network server **11** to the user's mobile data communication device **24**, where the redirector software **12** is operating at the server **11**. This configuration is particularly advantageous for use with message servers such as Microsoft's® Exchange Server, which is normally operated so that all user messages are kept in one central location or mailbox store on the server instead of in a store within each user's desktop PC. This configuration has the additional advantage of allowing a single system administrator to configure and keep track of all users having messages redirected. If the system includes encryption keys, these too can be kept at one place for management and update purposes.

In this alternative configuration, server **11** preferably maintains a user profile for each user's desktop system **10, 26, 28**, including information such as whether a particular user can have data items redirected, which types of message and information to redirect, what events will trigger redirection, the address of the users' mobile data communication device **24**, the type of mobile device, and the user's preferred list, if any. The event triggers are preferably detected at the user's desktop system **10, 26, 28** and can be any of the external, internal or network events listed above. The desktop systems **10, 26, 28** preferably detect these events and then transmit a message to the server computer **11** via LAN **14** to initiate redirection. Although the user data items are preferably stored at the server computer **11** in this embodiment, they could, alternatively, be stored at each user's desktop system **10, 26, 28**, which would then transmit them to the server computer **11** after an event has triggered redirection.

As shown in FIG. **2**, desktop system **26** generates a message A that is transmitted to and stored at the host system **11**, which is the network server operating the redirector program **12**. The message A is for desktop system **10**, but in this embodiment, user messages are stored at the network server **11**. When an event occurs at desktop system **10**, an event trigger is generated and transmitted to the network server **11**, which then determines who the trigger is from, whether that desktop has redirection capabilities, and if so, the server (operating the redirector program) uses the stored configuration information to redirect message A to the mobile computer **24** associated with the user of desktop system **10**.

As described above with reference to FIG. **1**, message C could be either a command message from a user's mobile data communication device **24**, or it could be a message from an external computer, such as a computer connected to the Internet **18**. If the message C is from an Internet computer to the user's desktop system **10**, and the user has redirection capabilities, then the server **11** detects the message C, repackages it using electronic envelope B, and redirects the repackaged message (C in B) to the user's mobile device **24**. If the message C is a command message from the user's mobile device **24**, then the server **11** simply acts upon the command message.

Turning now to **FIG. 3**, a block diagram showing the interaction of the redirector software **12** with additional components of the host system **10** of FIG. **1** (the desktop PC) to enable more fully the pushing of information from the host system **10** to the user's mobile data communication device **24** is set forth. These additional components are illustrative of the type of event-generating systems that can be configured and used with the redirector software **12**, and of the type of repackaging systems that can be used to interface with the mobile communication device **24** to make it appear transparent to the user.

The desktop system **10** is connected to LAN **14**, and can send and receive data, messages, signals, event triggers, etc., to and from other systems connected to the LAN **14** and to external networks **18, 22**, such as the Internet or a wireless data network, which are also coupled to the LAN **14**. In addition to the standard hardware, operating system, and application programs associated with a typical microcomputer or workstation, the desktop system **10** includes the redirector program **12**, a TCP/IP sub-system **42**, an E-mail sub-system **44**, a primary data storage device **40**, a screen saver sub-system **48**, and a keyboard sub-system **46**. The TCP/IP and E-mail subsystems **42, 44** are examples of repackaging systems that can be used to achieve the transparency of the present invention, and the screen saver and keyboard sub-systems **46, 48** are examples of event generating systems that can be configured to generate event messages or signals that trigger redirection of the user selected data items.

The method steps carried out by the redirector program **12** are described in more detail in FIG. **4**. The basic functions of this program are: (1) configure and setup the user-defined event trigger points that will start redirection; (2) configure the types of user data items for redirection and optionally configure a preferred list of senders whose messages are to be redirected; (3) configure the type and capabilities of the user's mobile data communication device; (4) receive messages and signals from the repackaging systems and the event generating systems; and (5) command and control the redirection of the user-selected data items to the mobile data communication device via the repackaging systems. Other functions not specifically enumerated could also be integrated into this program.

The E-Mail sub-system **44** is the preferred link to repackaging the user-selected data items for transmission to the mobile data communication device **24**, and preferably uses industry standard mail protocols, such as SMTP, POP, IMAP, MIME and RFC-822, to name but a few. The E-Mail sub-system **44** can receive messages A from external computers on the LAN **14**, or can receive messages C from some external network such as the Internet **18** or a wireless data communication network **22**, and stores these messages in the primary data store **40**. Assuming that the redirector **12** has been triggered to redirect messages of this type, the redirector detects the presence of any new messages and instructs the E-Mail system **44** to repackage the message by placing an outer wrapper B about the original message A (or C), and by providing the addressing information of the mobile data communication device **24** on the outer wrapper B. As noted above, this outer wrapper B is removed by the mobile device **24**, and the original message A (or C) is then recovered, thus making the mobile device **24** appear to be the desktop system **10**.

In addition, the E-Mail sub-system **44** receives messages back from the mobile device **24** having an outer wrapper with the addressing information of the desktop system **10**, and strips this information away so that the message can be routed to the proper sender of the original message A (or C). The E-Mail sub-system also receives command messages C

from the mobile device **24** that are directed to the desktop system **10** to trigger redirection or to carry out some other function. The functionality of the E-Mail sub-system **44** is controlled by the redirector program **12**.

The TCP/IP sub-system **42** is an alternative repackaging system. It includes all of the functionality of the E-Mail sub-system **44**, but instead of repackaging the user-selected data items as standard E-mail messages, this system repackages the data items using special-purpose TCP/IP packaging techniques. This type of special-purpose sub-system is useful in situations where security and improved speed are important to the user. The provision of a special-purpose wrapper that can only be removed by special software on the mobile device **24** provides the added security, and the bypassing of E-mail store and forward systems can improve speed and real-time delivery.

As described previously, the present invention can be triggered to begin redirection upon detecting numerous external, internal and networked events, or trigger points. Examples of external events include: receiving a command message from the user's mobile data communication device **24** to begin redirection; receiving a similar message from some external computer; sensing that the user is no longer in the vicinity of the host system; or any other event that is external to the host system. Internal events could be a calendar alarm, screen saver activation, keyboard timeout, programmable timer, or any other user-defined event that is internal to the host system. Networked events are user-defined messages that are transmitted to the host system from another computer that is connected to the host system via a network to initiate redirection.

The screen saver and keyboard sub-systems **46, 48** are examples of systems that are capable of generating internal events. Functionally, the redirector program **12** provides the user with the ability to configure the screen saver and keyboard systems so that under certain conditions an event trigger will be generated that can be detected by the redirector **12** to start the redirection process. For example, the screen saver system can be configured so that when the screen saver is activated, after, for example, **10** minutes of inactivity on the desktop system, an event trigger is transmitted to the redirector **12**, which starts redirecting the previously selected user data items. In a similar manner the keyboard sub-system can be configured to generate event triggers when no key has been depressed for a particular period of time, thus indicating that redirection should commence. These are just two examples of the numerous application programs and hardware systems internal to the host system **10** that can be used to generate internal event triggers.

FIGS. **4** and **5**, set forth, respectively, flow charts showing the steps carried out by the redirector software **12** operating at the host system **10**, and the steps carried out by the mobile data communication device **24** in order to interface with the host system. Turning first to FIG. **4**, at step **50**, the redirector program **12** is started and initially configured. The initial configuration of the redirector **12** includes: (1) defining the event triggers that the user has determined will trigger redirection; (2) selecting the user data items for redirection; (3) selecting the repackaging sub-system, either standard E-Mail, or special-purpose technique; (4) selecting the type of data communication device, indicating whether and what type of attachments the device is capable of receiving and processing, and inputting the address of the mobile device; and (5) configuring the preferred list of user selected senders whose messages are to be redirected.

FIG. **4** sets forth the basic steps of the redirector program **12** assuming it is operating at a desktop system **10**, such as shown in FIG. **1**. If the redirector **12** is operating at a network server **11**, as shown in FIG. **2**, then additional configuration steps may be necessary to enable redirection for a particular desktop system **10, 26, 28** connected to the server, including: (1) setting up a profile for the desktop system indicating its address, events that will trigger redirection, and the data items that are to be redirected upon detecting an event; (2) maintaining a storage area at the server for the data items; and (3) storing the type of data communication device to which the desktop system's data items are to be redirected, whether and what type of attachments the device is capable of receiving and processing, and the address of the mobile device.

Once the redirector program is configured **50**, the trigger points (or event triggers) are enabled at step **52**. The program **12** then waits **56** for messages and signals **54** to begin the redirection process. A message could be an E-Mail message or some other user data item than may have been selected for redirection, and a signal could be a trigger signal, or could be some other type of signal that has not been configured as an event trigger. When a message or signal is detected, the program determines **58** whether it is one of the trigger events that has been configured by the user to signal redirection. If so, then at step **60** a trigger flag is set, indicating that subsequently received user data items (in the form of messages) that have been selected for redirection should be pushed to the user's mobile data communication device **24**.

If the message or signal **54** is not a trigger event, the program then determines at steps **62, 68** and **66** whether the message is, respectively, a system alarm **62**, an E-Mail message **64**, or some other type of information that has been selected for redirection. If the message or signal is none of these three items, then control returns to step **56**, where the redirector waits for additional messages **54** to act upon. If, however the message is one of these three types of information, then the program **12** determines, at step **68**, whether the trigger flag has been set, indicating that the user wants these items redirected to the mobile device. If the trigger flag is set, then at step **70**, the redirector **12** causes the repackaging system (E-Mail or TCP/IP) to add the outer envelope to the user data item, and at step **72** the repackaged data item is then redirected to the user's mobile data communication device **24** via LAN **14**, WAN **18**, wireless gateway **20** and wireless network **22**. Control then returns to step **56** where the program waits for additional messages and signals to act upon. Although not shown explicitly in FIG. **4**, after step **68**, the program could, if operating in the preferred list mode, determine whether the sender of a particular data item is on the preferred list, and if not, then the program would skip over steps **70** and **72** and proceed directly back to step **56**. If the sender was on the preferred list, then control would similarly pass to steps **70** and **72** for repackaging and transmission of the message from the preferred list sender.

FIG. **5** sets forth the method steps carried out by the user's mobile data communication device **24** in order to interface to the redirector program **12** of the present invention. At step **80** the mobile software is started and the mobile device **24** is configured to operate with the system of the present invention, including, for example, storing the address of the user's desktop system **10**.

At step **82**, the mobile device waits for messages and signals **84** to be generated or received. Assuming that the redirector software **12** operating at the user's desktop system **10** is configured to redirect upon receiving a message from the user's mobile device **24**, at step **86**, the user can decide to generate a command message that will start redirection. If the user does so, then at step **88** the redirection message is

composed and sent to the desktop system **10** via the wireless network **22**, through the wireless gateway **20**, via the Internet **18** to the LAN **14**, and is finally routed to the desktop machine **10**. In this situation where the mobile device **24** is sending a message directly to the desktop system **10**, no outer wrapper is added to the message (such as message C in FIGS. **1** and **2**). In addition to the redirection signal, the mobile device **24** could transmit any number of other commands to control the operation of the host system, and in particular the redirector program **12**. For example, the mobile **24** could transmit a command to put the host system into the preferred list mode, and then could transmit additional commands to add or subtract certain senders from the preferred list. In this manner, the mobile device **24** can dynamically limit the amount of information being redirected to it by minimizing the number of senders on the preferred list. Other example commands include: (1) a message to change the configuration of the host system to enable the mobile device **24** to receive and process certain attachments; and (2) a message to instruct the host system to redirect an entire data item to the mobile device in the situation where only a portion of a particular data item has been redirected.

Turning back to FIG. **5**, if the user signal or message is not a direct message to the desktop system **10** to begin redirection (or some other command), then control is passed to step **90**, which determines if a message has been received. If a message is received by the mobile, and it is a message from the user's desktop **10**, as determined at step **92**, then at step **94** a desktop redirection flag is set "on" for this message, and control passes to step **96** where the outer envelope is removed. Following step **96**, or in the situation where the message is not from the user's desktop, as determined at step **92**, control passes to step **98**, which displays the message for the user on the mobile device's display. The mobile unit **24** then returns to step **82** and waits for additional messages or signals.

If the mobile device **24** determines that a message has not been received at step **90**, then control passes to step **100**, where the mobile determines whether there is a message to send. If not, then the mobile unit returns to step **82** and waits for additional messages or signals. If there is at least one message to send, then at step **102** the mobile determines whether it is a reply message to a message that was received by the mobile unit. If the message to send is a reply message, then at step **108**, the mobile determines whether the desktop redirection flag is on for this message. If the redirection flag is not on, then at step **106** the reply message is simply transmitted from the mobile device to the destination address via the wireless network **22**. If, however, the redirection flag is on, then at step **110** the reply message is repackaged with the outer envelope having the addressing information of the user's desktop system **10**, and the repackaged message is then transmitted to the desktop system **10** at step **106**. As described above, the redirector program **12** executing at the desktop system then strips the outer envelope and routes the reply message to the appropriate destination address using the address of the desktop system as the "from" field, so that to the recipient of the redirected message, it appears as though it originated from the user's desktop system rather than the mobile data communication device.

If, at step **102**, the mobile determines that the message is not a reply message, but an original message, then control passes to step **104**, where the mobile determines if the user is using the redirector software **12** at the desktop system **10**, by checking the mobile unit's configuration. If the user is not using the redirector software **12**, then the message is simply transmitted to the destination address at step **106**. If, however, the mobile determines that the user is using the redirector software **12** at the desktop system **10**, then control passes to step **110**, where the outer envelope is added to the message. The repackaged original message is then transmitted to the desktop system **10** at step **106**, which, as described previously, strips the outer envelope and routes the message to the correct destination. Following transmission of the message at step **106**, control of the mobile returns to step **82** and waits for additional messages or signals.

Organizing and storing messages in the mobile device **24** and the host system **10** is set forth in FIGS. **6** through **18**. The mobile device **24** preferably includes a hierarchical folder system, as does the host system **10**. The user can select from multiple levels of folders to find a certain folder. For example, the user can organize messages into categories such as friends, co-workers, contacts, and "to do" list on the mobile device **24** and at the host system **10**. Software on the mobile device **24** and the host system **10** organizes the messages so that filing a message on either the mobile device **24** or the host system **10** will be recognized at the other end either by commands sent through the redirector program or by synchronizing the mobile device with the host system. Synchronization can occur, for example, by plugging the mobile device into an interface cradle coupled to the host system or through a wireless device-to-host interface.

FIG. **6** sets forth a preferred message structure **120** and folder structure **130** for messages and folders that are stored on the host system **10** and the mobile device **24**. The message structure **120** includes a message body and a message header. The message header preferably includes tags such as a message ID and a folder ID. The message ID is a unique tag that is associated with a single message. The message ID is assigned to a message when the message is received in the store. The folder ID is a tag that contains the unique ID of the folder in which the message is to be stored.

The folder structure includes a folder ID, folder type, folder name, parent folder ID, and parent folder type. The folder ID is a unique tag for each folder. The folder ID is generated when the mobile device **24** is synchronized to the host system **10**. The folder type specifies attributes of the folder that differentiate it from other folders. One such folder could be a deleted items folder. The deleted items folder could be set to automatically purge messages after a given time. The folder name is the name of the folder that will be displayed on the device **24** or the host system **10**. The parent folder ID is the folder ID of the folder that is one level above the current folder in the hierarchical system. The parent folder type specifies attributes of the parent folder that differentiates it from other folders.

FIG. **7** is a flow chart illustrating the basic steps of synchronizing folders and messages between the host system **10** and the mobile device **24**. Synchronization starts in step **140** when the mobile device **24** is coupled to the host system **10** by, for example, (1) placing the device in an interface cradle or a suitable equivalent; or (2) initiating an over-the-wireless-network synchronization. In this step, the folder hierarchy is received and tagged and the folder list is created in step **142** from a store at the host system **10**. In step **144**, the mobile device **24** is updated using the list of folders from the store. After the folders on the mobile device are updated **144** to match the folder structures **130** in the host system **10**, the messages stored in the host system **10** are retrieved in step **146**. The messages in the mobile device **24** are similarly retrieved in step **148**. Step **150** compares the unique message IDs of messages in the mobile device **24** and

the host system **10** to find similar messages. Once similar messages are found on the mobile device **24** and the host system **10**, step **152** determines whether or not a message has been moved within the folder system. When one of the two messages (host message and mobile device message) is determined to have been moved, the other message is moved to the folder that matches the folder ID of the moved message in step **154**. All similar messages from the mobile device **24** and the host system **10** are checked to determine **152** where the messages should be placed and moved **154** accordingly.

The folder structure synchronization process **136** first synchronizes the folder hierarchy of the mobile device **24** to the hierarchy of the host system and then moves a message that the user has filed in a folder on the mobile device **24** to the corresponding folder on the host system **10**. Correspondingly, when the user has filed a message in a folder on the host system **10**, the folder structure synchronization process **136** will move the message to the corresponding folder on the mobile device **24**. This is advantageous, for example, for a user who uses his default message receive folder (inbox)as a measure of incomplete and complete jobs. It also eliminates the need to deal with the message a second time once the user returns to the office and uses primarily the host system and the associated folder structure therein.

FIGS. **8** through **18** illustrate in more detail the steps required to synchronize the messages and folders of the mobile device **24** to the host system **10**. FIG. **8** sets forth the method steps carried out by the host system **10** to assign folder IDs to the folders (step **142** from FIG. **7**). When the mobile device **24** is coupled with **160** the host system **10**, the last assigned folder ID is retrieved from the mobile device **24** at step **162**. A "special" folder list is retrieved in step **164** from the store of the host system **10**. A "special" folder is a folder such as a deleted folder or an inbox folder where specific rules are set for managing messages within the folder. Based on the hierarchical structure, the host system **10** gets the top folder in step **166** and checks if the top folder is flagged in step **168**. If the top folder is not flagged, step **170** assigns a folder ID to the folder based on the last assigned number retrieved in step **162**. Once the top folder is assigned an ID number, the top folder is checked against the special folders and assigned a folder type in step **172**.

By continuing to select through the hierarchical folder structure, step **174** retrieves subfolders of the top folder. The subfolder is checked for a folder ID in step **176** and assigned a folder ID in step **178** if no folder ID is found in step **176**. Step **180** assigns a folder type to the subfolder. Step **182** checks for a subfolder underneath the current folder. If another subfolder is found, it is assigned as the top folder in step **184** and returned to step **174**. If there are no more subfolders underneath the current subfolder, step **186** retrieves the next subfolder and returns the retrieved subfolder to step **176**. Once the last subfolder is retrieved, step **190** ends the tag and retrieve step **142** of the folder structure synchronization process **136**. Overall, this is a recursive operation performed for all the subfolders starting from the top folder of the information store.

FIG. **9** sets forth the steps of retrieving the messages from the host system **10** as shown in step **146** of FIG. **7**. Step **200** retrieves the list of messages from the store that have the unique IDs assigned to them. The message is checked for a folder ID in step **202**. If a folder ID is not assigned, the current folder ID is assigned to the message in step **204**. Step **206** checks the folder ID of the message against the current folder ID to see if they match. If the current folder ID and the folder ID on the message do not match, a move flag is set in step **208**. The current folder ID is indicated in step **210**, the next message is retrieved in step **212**, and the next message is returned to step **202**. Once all messages with unique IDs have been retrieved in step **212**, the process ends in step **214**. The list of messages with unique IDs retrieved from the store is referred to as messages 'A'.

The steps set forth in FIG. **9** are repeated for the mobile device **24**. The messages from the mobile device **24** are referred to as messages 'B'. Once these steps have been accomplished, the folder structure synchronization process **136** includes a list of all unique messages 'B' and 'A' in the mobile device **24** and the host system **10**, respectively. For each message in the list, a move flag is either on or off. The move flags of equivalent messages in the set of messages 'A' and 'B' are compared in FIGS. **10A** and **10B** to determine the proper folder placement of the message.

FIGS. **10A** and **10B** set forth the steps of synchronizing the messages between the host system **10** and the mobile device **24**. Step **220** of FIG. **10** checks to see if there is a match between the message IDs of the current message 'A' and the first message 'B'. If the IDs do not match, step **222** updates message 'B' to the next message in the list of 'B' messages. Once a matching message is found, step **224** checks if the move flag for message 'A' is on and the move flag for message 'B' is off. If this is the case, message 'B' is moved to the folder having the folder ID of message 'A' on the mobile device **24** in step **226**. If the move flag status is not equal to the check in step **224**, step **230** checks for a different flag status.

Step **230** checks if the move flag for message 'B' is on and the move flag for message 'A' is off. If this is the case, message 'A' is moved to the folder having the folder ID of message 'B' on the host system in step **232**. If the move flag status is not equal to the check in step **230**, step **234** checks for move flags in both message 'A' and message 'B' to be on. If both flags are on, step **238** decides which message to move based on a conflict resolution structure. The conflict resolution structure is a predetermined rule where the software moves one of the messages based on the folder ID of the other message. If both flags are off, step **240** checks to see if the folder IDs of message 'A' and message 'B' are different. If the folder IDs are different, the conflict resolution structure of step **238** decides which message to move. If the folder IDs are the same, messages 'A' a nd 'B' remain in their current folders as shown in step **242**.

Step **246** checks if message 'B' was moved. If message 'B' was not moved, the message 'B' move flag is reset in step **250**. Message 'A' is checked in step **252** to see if it moved. If message 'A' did not move, the move flag for message 'A' is reset **254**. This is accomplished by updating the folder ID on message 'A' with the folder ID that was found in during step **210**. The procedure for checking the move status of the messages is completed in step **256**.

FIG. **11** sets forth the preferable method steps of assigning an ID to a newly received message at the host system for redirection. When a new message is received in step **260**, the message is tagged with a unique ID in step **262**. Once the message has a unique ID, step **264** checks if the folder in which the message is to be stored has an assigned folder ID. If the folder has an ID, the folder ID of the message structure **120** for the new message is set to the folder ID value in step **266**. If the folder does not have an ID, the folder ID of the message structure **120** for the new message is set to zero as shown in step **268**. After the folder ID has been set in step **266** or **268**, the message is sent to the device by the redirector in step **270**.

The user has the option to move a message between folders on either the mobile device **24** or the host system **10**. For example, a user who has a "to do" folder on both the host system **10** and the mobile device **24**, might receive a message on the mobile device **24** when he is away from his host system **10**. The redirector program might be instructed to place incoming messages into an Inbox folder on the device. After reviewing the message, the user decides to file the message into the "to do" folder on the mobile device **24**. The software system for organizing messages and folders on the mobile device **24** sends a move signal to the host system **10** to move the same message to the "to do" folder on the host system. Later, the user decides to move the message again to a "completed tasks" folder which also resides on both the mobile device **24** and the host system **10**, but this time the user initiates the move at the host system **10**. The host system **10** sends a move signal to the mobile device **24** to initiate the same move on the mobile device **24**. This method and system of moving messages between folders on the host system **10** and the mobile device **24** employs the "push" paradigm of the redirector software. The method steps for moving the message between folders are shown in FIG. **12** and the method steps of FIGS. **13–17** show the steps taken at the host system **10** and the mobile device **24** when the user has initiated a move on at either the host system or mobile device.

As shown in FIG. **12**, to file a message on the mobile device **24**, the message is selected in step **280**. A folder to place the message is selected in step **282**. The selected message is moved to the selected folder in step **284**. The folder ID of the selected folder is assigned to the folder ID of the message structure **120** for the selected message in step **286** and the move flag status is set in step **288**. Finally, the message has been properly moved and the steps end at step **290**.

Once the message has been moved on either the mobile device **24** or the host system **10**, the redirector preferably attempts to move the identical message to the corresponding folder on the other end to provide a true mirrored (i.e., synchronized) organization of information as illustrated in FIGS. **13** and **16**. Shown in FIG. **13** are the preferred steps in sending a move signal from the mobile device **24** to the host system **10** via the wireless network **22** as disclosed herein. The preferred steps are referred hereinafter to as the "over-the-air-move" process. After the message has been moved in step **292** of FIG. **13**, step **294** sends a command to move the message x to the folder y and waits for a confirmation signal in step **296**. Step **298** checks if the redirector successfully moved the message. If the message was moved, the folder ID of message x is updated in step **300**. If the message was not moved, then the redirector proceeds with its normal operation in step **302**, and the message will be moved during synchronization.

The over-the-air-move process is preferably in the control of the user. In circumstances where the user desires to limit bandwidth consumption, it may be desirable to switch the over-the-air-move feature off and to leave synchronization of information organization until device-host synchronization through the wired interface cradle. In another embodiment of the present invention, the mobile device **24** bundles together and compresses the various move commands (or other operations) created during the day and transmits the same during non-peak transmission times.

Moving a message on the mobile device **24** requires a move command to be sent to the host system **10** as described above. But, moving a message on the host system requires both checking to see if the message was redirected to the mobile device **24** and if the folder the message was moved to exists on the mobile device **24**. These steps are set forth in FIG. **14**. Once the redirector has received a move message command from the host system **10** that a message has been moved in step **304**, the redirector checks to see if the message has been redirected to the device in step **306**. If the message was not redirected to the mobile device **24**, the redirector does not attempt to send the move command and proceeds with its normal operation at step **308**. If the message was delivered to the mobile device **24**, then step **310** determines if the folder that the message was moved to has a folder ID. The folder may not have an ID if, for example, the user created the folder at some point after the last synchronization. If the folder does not have a folder ID, the redirector does not forward the move message command and the redirector proceeds with its normal operation at step **314**. The move will be made when the mobile device **24** and the host system **10** are synchronized and the folder with the correct folder structure **130** is generated.

If the folder ID does exist for the folder, then the move message command is sent in step **316**. The redirector awaits acknowledgement of the move in step **318**. If the acknowledgement is not received, the redirector proceeds with its normal operation at step **320**, or alternatively, attempts to retransmit the move message command. If acknowledgement of the move is received, step **322** tags the message with the current folder ID.

FIG. **15** shows the steps performed at the mobile device **24** when a move message command is received from the host system **10**. Similarly, FIG. **16** shows the steps performed at the host system **10** when a move command is received from the mobile device **24**. Both functions require (1) receiving a move command, (2) checking to see if the command may be executed, and (3) reacting with a negative confirmation or moving the message and positively confirming.

Step **330** of FIG. **15** occurs when the mobile device **24** receives a move command. Step **332** checks if the folder exists on the mobile device **24**. If the folder does not exist, a negative confirmation is sent to the host system **10** in step **334**. Otherwise, the mobile device **24** is tagged **336** with the new folder ID, the message's folder ID is updated in step **338**, and a positive confirmation is sent to the host system **10** in step **340**.

FIG. **16** shows the steps of acting upon a move message command at the host system **10**. The move command is received **350**. Step **352** locates the message in the store. Step **354** determines if the folder is located in the store. If the folder is not located in the store, a negative confirmation is sent to the mobile device **24** in step **356**. If the folder is located in the store, the message is moved **360** to the folder. Step **362** determines if the move was successful. A successful move updates the message's folder ID in step **364** while an unsuccessful move sends a negative confirmation **370** to the mobile device **24**.

Special folders can require a special set of instructions to deal with message management. For example, a deleted folder can be created to detect deletions at either the mobile device **24** or the host system **24**. When the message is deleted, the redirector must check to see if the user has previously chosen to delete messages off of both the mobile device **24** and the host system **10** when it is deleted on one of these two.

The steps set forth in FIG . **17** show how the device accordingly handles a delete request. The delete process is started **380** when the user has selected a message for

deleting. The message is selected **382** and then deleted **384** by the software on the mobile device **24**. The software on the device then determines **386** if the delete feature is set to delete messages on both the mobile device **24** and the host system **10**. If the delete feature is not set for the host system and the device, the software simply deletes the message locally **390**. If the delete feature is set for the host system and the device, the folder ID of the deleted folder is assigned to the message in step **392**. The move flag for the message is set on **394** so that the deletion can be detected on the other device. The delete process is completed **396**. In the case where the user deletes a message on the host system, the deletion of that message will be reflected upon synchronization.

Finally, the folder management system controls wasted use of resources by purging the earliest messages once allocated space is exceeded, as shown in FIG. **18**. The purge process is started in step **400**. The software determines **402** if storage requirements exceed the storage space allocated for messages. If the storage requirements are not exceeded, the purge process is ended **404**. If the storage space is exceeded the earliest message is deleted, but the message structure **120** is retained in step **406**.

FIGS. **19** and **20** set forth a method of using folder lists as a trigger source for the redirector program **12**. In FIG. **19**, the user selects **408** a folder and the folder is stored **410** in the folder list. FIG. **20** shows the steps set forth for forwarding a message based on the folder list. The message could, for instance be a new piece of mail. The folder list is loaded **412**. A new mail notification is received **414**. The software checks if the mail is in a folder from the folder list in step **416**. If the mail is not in a folder listed in the folder list, the process stops **418**. If the mail is in a folder listed in the folder list, then the redirector forwards the message to the mobile device **24** in step **420**, as described above.

In another aspect of the present invention, wireless mobile data communications devices, especially those that can return a confirmation signal to the host that the pushed data has been received, are utilized in conjunction with the redirector program. It is also possible for the mobile data communications device to include additional information with the confirmation signal, including, any one or more of the following actions, the fact that the message: has been read (the information associated therewith is a "read signal"); has been filed in a specific folder (the information associated therewith is a "filed signal"); has been forwarded to another recipient (the information associated therewith is a "forward signal"); or, has been replied to (the information associated therewith is a "reply signal"). These actions can then be synchronized with the host system, thus eliminating the need for the user to perform these actions a second time.

Traditionally, message status icons are associated with messages at the host system **10**. A message status icon is a graphical image indicating the state of the message. States may indicate that: a message is new, a message has been read, a message has been deleted, a message has been forwarded, a message has been replied to, a message has been filed or any combination thereof The message status icon is preferably in close physical proximity, when viewed by the user as a list of messages, to the corresponding message and other corresponding message details (such as subject, sender's name, arrival time, etc.) in the graphical user interface. By way of example, if a user at the host system forwards a message from the host system to another party, the message status icon will be altered in appearance to indicate to the user a forwarding action has been applied to that particular message. In this manner and advantageously, the user has a quick visual method of reviewing a list of messages in a folder and the states of the messages, thereby knowing the actions that have already taken place with respect to those messages at the host system **10**.

In accordance with the present invention and preferably, as a consequence of receiving at the host system **10** at least one of a plurality of action signals from the mobile **24** (i.e., a read signal, a filed signal, a forward signal or a reply signal), a graphical change will occur at the host system **10** to a message status icon, which is associated with the message acted upon at the mobile, to indicate to the user upon his return and access to the host system that the message has been acted upon (i.e., read, replied to, forwarded and/or filed, etc.) at the mobile. The graphical change will result in a second message status icon distinguishable from the first message status icon and, preferably, the graphical representation of the second message status icon clearly illustrates the state of the message. In one embodiment of the present invention and preferably, as a consequence of receiving a filed signal, the host system application associated with the message will move the message to the appropriate folder so that the user upon his return and access of the host system will see information organized in the same manner as in the mobile device. In the case of a filed message that is also read at the mobile, the corresponding message, at the host system, is moved and the message status icon associated therewith at the host system is altered to indicate the read status. Likewise, in the case where a message is read and forwarded to another party at the mobile, a single second message status icon will preferably represent both statuses (i.e, read and forwarded). Preferably, any second message status icon graphical representation resulting from an action event taking place at the mobile is the same graphical representation that would occur if the action event had been undertaken at the host system **10** rather than the mobile **24**. Alternatively and at the user's control preferably, any graphical representation is clearly distinguishable as to be the status change resulting from an action taking place at the mobile versus an action taking place at the host system. In the latter embodiment, the user of the redirector system herein will have quick and reliable information as to where the message was read, filed, forwarded, or replied from. Preferably and where a read-receipt is requested by a sender of the message, upon receiving the read signal from the mobile, the redirector or any associated message application such MS Exchange™ or Lotus Notes™ will direct a read-receipt signal to the read-receipt requester.

In one embodiment of the present invention, the invention allows for a notification of the state of a redirected message at the mobile. It is to be understood that the status signals may be forwarded to the host system during other times as well, such as during synchronization or real-time over-the-air-moves as described below.

In another embodiment of the present invention, there is provided a method of indicating at the host system the state of the message at the mobile communications device. The steps of this method preferably include: (A) altering the state of a first message at the mobile communications device thereby creating an altered state; (B) forwarding a status signal to the host system; and, (C) changing at the host system a first message status icon based on the altered state at the mobile communications device. Therefore, according to one aspect of the invention, the message status icon change indicates an altered state of the message at the mobile communication device.

In another embodiment of the present invention, there is provided a method of indicating at the host system the state of the message at the mobile communications device. The steps of this method preferably include: (A) redirecting a first message from the host system to the mobile commu-

nications device, wherein the first message at the host system has a first message status icon; (B) receiving the redirected first message from the host system at the mobile communications device; (C) altering the state of the first message at the mobile communications device thereby creating an altered state; (D) forwarding a status signal to the host system; and, (E) changing at the host system the first message status icon based on the action taken at the mobile communications device.

In one embodiment of the invention, there is provided a method of indicating at a first device such as a sender's host system or mobile device, via the host system the state of the message at the mobile communications device. The steps of this method preferably include: (A) redirecting a first message from the host system to the mobile communications device, wherein the first message at the host system has a first message status icon; (B) receiving the redirected first message from the host system at the mobile communications device; (C) altering the state of the first message at the mobile communications device thereby creating an altered state; (D) forwarding a status signal to the host system; and, (E) changing at the host system the first message status icon based on the action taken at the mobile communications device; and (F) forwarding a read-receipt to a read-receipt requester's device.

Having described in detail the preferred embodiments of the present invention, including the preferred methods of operation, it is to be understood that this operation could be carried out with different elements and steps. This preferred embodiment is presented only by way of example and is not meant to limit the scope of the present invention which is defined by the following claims.

What is claimed:

1. A method of two-way synchronization between electronic mailboxes stored at a host system and a mobile communication device, each of the electronic mailboxes being organized into a set of hierarchical folders for storing received messages, the method comprising the steps of:

receiving messages at the host system and storing the received messages in the set of hierarchical folders of the host system's electronic mailbox;

determining whether to redirect the received messages from the host system to the mobile communication device and for each message that meets the determining step, assigning a unique message ID to the message and redirecting the message with its unique message ID to the mobile communication device;

receiving the redirected messages at the mobile communication device and storing them in the set of hierarchical folders at the mobile communication device;

coupling the mobile communication device to the host system;

synchronizing the set of hierarchical folders at the host system with the set of hierarchical folders at the mobile communication device;

retrieving a first list of messages from the host system, wherein the first list of messages are those messages that met the determining step and were redirected to the mobile communication device;

retrieving a second list of messages from the mobile communication device;

comparing the first list of messages to the second list of messages to identify messages having the same unique message ID and to determine whether the messages having the same unique message ID are stored in the same folders within the respective sets of hierarchical folders at the host system and the mobile communication device where the messages are stored; and

if the messages having the same unique message IDs are stored in different folders within the respective sets of hierarchical folders then determining which message should be moved and moving that message so that the messages having the same unique message IDs are stored in the same folders within the respective sets of hierarchical folders at the host system and the mobile communication device.

2. The method of claim **1**, further comprising the steps of:

de-coupling the mobile communication device and the host system;

subsequently moving one of the messages at the mobile communication device so that it is stored in a different folder than the message having the same unique message ID at the host system;

transmitting a move command message from the mobile communication device to the host system to indicate that the message has been moved, the move command message including the unique message ID of the moved message and an identification of the folder in which the message is presently stored at the mobile communication device; and

moving the message corresponding to the unique message ID contained in the move command message at the host system so that it is stored in the same folder as the folder identified in the move command message.

3. The method of claim **2**, wherein the move message command is transmitted from the mobile communication device to the host system over a wireless connection, further comprising the steps of:

enabling the transmission of the move message commands at the mobile communication device, wherein a user of the mobile communication device can either enable or disable the transmission of the move message commands.

4. The method of claim **1**, further comprising the steps of:

de-coupling the mobile communication device and the host system;

subsequently moving one of the messages at the host system that was redirected to the mobile communication device so that it is stored in a different folder than the message having the same unique message ID at the mobile communication device;

transmitting a move command message from the host system to the mobile communication device to indicate that the message has been moved, the move command message including the unique message ID of the moved message and an identification of the folder in which the message is presently stored at the host system; and

moving the message corresponding to the unique message ID contained in the move command message at the mobile communication device so that it is stored in the same folder as the folder identified in the move command message.

5. The method of claim **1**, wherein the host system and the mobile communication device are coupled via a wired connection.

6. The method of claim **1**, wherein the host system and the mobile communication device are coupled via a wireless connection.

7. The method of claim **1**, wherein the synchronizing the set of hierarchical folders step further comprises the steps of:

associating a unique folder ID with each folder in the sets of hierarchical folders at the host system and the mobile communication device;

generating a folder list including the folder IDs of the set of hierarchical folders at the host system;

providing the folder list to the mobile communication device; and

updating the set of hierarchical folders at the mobile communication device using the folder list so that the set matches the set of hierarchical folders at the host system.

8. The method of claim 1, further comprising the steps of:

associating a move flag with each of the messages having unique message IDs at both the host system and the mobile communication device; and

setting the move flag for each message that is moved from one folder to another folder at either the host system or the mobile communication device.

9. The method of claim 8, wherein the comparing step further comprises the step of examining the move flags for each of the messages having the same unique message IDs to determine if one of the messages have been moved from one folder to another folder at either the host system of the mobile communication device.

10. The method of claim 1, further comprising the steps of:

associating a folder ID with each message stored in the host system and the mobile communication device, wherein the folder IDs identify the folder location of each message within the respective sets of hierarchical folders; and

wherein the comparing step further comprises the step of comparing the folder IDs of the messages that have the same unique message ID to determine whether the messages are stored in the same folders within the respective sets of hierarchical folders at the host system and the mobile communication device.

11. The method of claim 1, further comprising the steps of:

de-coupling the mobile communication device and the host system;

subsequently moving a plurality of the messages at the mobile communication device so that the plurality of messages are stored in a different folders than the messages having the same unique message IDs at the host system;

generating a move command message for each of the plurality of messages that were moved, each move command message indicating that the message has been moved, the move command message including the unique message ID of the moved message and an identification of the folder in which the message is presently stored at the mobile communication device;

bundling the move message commands into a bundled transmission and transmitting the bundled transmission to the host system; and

moving the messages corresponding to the unique message IDs contained in the bundled move command messages at the host system so that the messages are stored in the same folders as the folders identified in the bundled move command messages.

12. The method of claim 1, further comprising the steps of:

providing a message structure for storing the messages, the message structure including a header portion and a message portion, the header portion including fields for storing the unique message ID assigned to the message and also for storing an identification of the folder in which the message is stored.

13. The method of claim 1, further comprising the steps of:

providing a folder structure for each of the folders in the set of hierarchical folders at the host system and the mobile communication device, the folder structure including a folder identification field and a folder type field.

14. The method of claim 13, further comprising the steps of:

designating at least one of the folders in the set of hierarchical folders as a deleted message folder using the folder type field of the folder so designated; and

if the folder type field indicates that the folder is a deleted message folder, then periodically deleting all of the messages stored in that folder at the host system.

15. The method of claim 1, wherein the determining whether to redirect the received messages step further comprises the steps of:

designating certain folders in the set of hierarchical folders at the host system for redirection;

determining whether the received messages are stored in the designated folders, and if so, then assigning the unique message ID to those messages and redirecting them with the unique message IDs to the mobile communication device.

16. A method of two-way synchronization between electronic mailboxes stored at a host system and a mobile communication device, each of the electronic mailboxes being organized into a set of hierarchical folders for storing received messages, the method comprising the steps of:

coupling the mobile communication device to the host system;

synchronizing the set of hierarchical folders at the host system with the set of hierarchical folders at the mobile communication device;

retrieving a first list of messages from the host system and a second list of message from the mobile communication device, each list of messages including unique message IDs that identify the messages stored in the respective set of hierarchical folders on the host system and the mobile communication device;

comparing the first list of messages to the second list of messages to identify messages having the same unique message ID and to determine whether the messages having the same unique message ID are stored in the same folders within the respective sets of hierarchical folders;

if the messages having the same unique message IDs are stored in different folders within the respective sets of hierarchical folders then determining which message should be moved and moving that message so that the messages having the same unique message IDs are stored in the same folders within the respective sets of hierarchical folders at the host system and the mobile communication device;

de-coupling the mobile communication device and the host system;

subsequently moving one of the messages at the mobile communication device so that it is stored in a different folder than the message having the same unique message ID at the host system;

transmitting a move command message from the mobile communication device to the host system to indicate that the message has been moved, the move command message including the unique message ID of the moved message and an identification of the folder in which the message is presently stored at the mobile communication device; and

moving the message corresponding to the unique message ID contained in the move command message at the host system so that it is stored in the same folder as the folder identified in the move command message.

* * * * *